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Sophisticated Electoral Accountability

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Abstract

How does voter sophistication affect electoral accountability and policy-making? This paper studies this question in a political-economic model where a politician in office, with career concerns, can conceal relevant information for policy-making. Voters have a different level of electoral sophistication, yet all care about the provision of a public good. Sophistication helps voters to formulate correct electoral and economic decisions and can be developed by investing in education. Where this ability is low, voters misjudge the behavior of the politician in office who cheats the electorate, misappropriates public funds, and, nonetheless, obtains re-election. I discuss several implications of this equilibrium: *(i)* Political deception deters aware, sophisticated voters to invest in education. Hence this will keep down future political expertise and electoral accountability. *(ii)* Fully revealed information blocks any attempts of cheating and can help low sophisticated societies to embark in economic enhancing trajectories. In an infinite-horizon extension of the model, I underline a potential complementarity between accountability and sophistication that can be used to explain divergent equilibria in the long-run.

Keywords: political economy, belief manipulation, rent-seeking, political sophistication, education, path dependency

JEL Classification: D72, D83, I25

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1 Introduction

At the heart of the relationship between voters and elected representatives is the requirement voters set to determine whether to retain officeholders or replace them with alternatives. If voters judge the incumbent's past performance satisfactory so as to meet their requirement, they should be in favor of his re-election. If not, they vote the incumbent down and consider the alternatives the pool of politicians may offer to them.¹ In discerning the incumbent's record voters may focus on many aspects or rather use shortcuts; they may interpret messages differently and have various understanding of political dynamics.

Perhaps not surprisingly, there appears to be a substantial variation in the way constituencies discipline through democratic elections their elected representatives. In some democracies, politicians that reported scandals of corruption or misappropriation of public resources are forced to resign or, at the latest, heavily punished at the voting ballots; in others, corrupted politicians usually run for a further mandate and in not few cases they gain re-election. In Chad, for example, the current President of its Republic, Idris Déby, took over the power in 1990 and despite many accusals of corruption has been reelected with a majority of votes every five years.² In other words, it seems to be a quite heterogeneous setting rule voters use in different types of democracies and it seems that voters' requirements are less tight in democracies that feature corruption and poor economic institutions.

In this paper I develop a political career concern model in which the requirement of retaining office may vary among constituencies on the basis of their level of political sophistication. Psychologists and political scientists all have emphasized the central role played by voters' political sophistication in democracy. Political sophistication is the mode voters have developed to acquire information about politics; to enumerate and compare potentially relevant considerations with better exhaustiveness; to frame political issues in a more precise way; and to foresee consequences of politicians' behavior.³

¹The literature on electoral accountability is vast — see Ashworth (2012) for a comprehensive review and Putterman (2018) for a critical analysis that incorporates behavioral aspects.

²See, for example, the article “Feuding and corruption drain Chad of its best chance,” *The Telegraph*, April 23, 2006. Idris Déby does not stand alone in this parade of “Presidents for life,” that particularly features African democracies. See on this the article “Yoweri Museveni and other African Presidents for life,” *The New York Times*, May 12, 2016.

³Luskin (1990) defines a person politically sophisticated to the extent to which “*his or her political cognitions are numerous, cut a wide substantive swath, and are highly organized.*” Theoretical arguments as well as empirical evidence maintain that more politically sophisticated voters are more interested in politics and participate more in political activities (Verba and Nie, 1972; Klingemann, 1979; Inglehart,

Constituencies of voters that own different degrees of political sophistication are then arguably expected to monitor and discipline incumbents in a sensibly different mode. The monitoring and punishment exercised using political sophistication is what is here referred as the sophisticated electoral accountability.

To explore how politically sophisticated voters tie the hands of politicians with career concerns in extracting political rents, I begin with a simple two-period model in which an incumbent politician is appointed to accomplish a specific task — namely, to implement, at a cost, a public project (or a reform), productive and complementary to the voters’ economic activity. The incumbent may exercise discretion and decide to not provide the project, increasing his period 1 rents. Since my specific interest is in studying rent-seeking behavior and its variation across democracies, I assume that politicians are equally competent and that voters vote retrospectively casting their vote on account of the incumbent’s honesty.⁴ Hence, incumbent’s past behavior (within period 1) is the only relevant information voters can use; so re-election is that situation in which the former’s behavior meets with the voters’ requirement.

To this set-up I add uncertainty and Bayesian sophistication. The key features of the model are as follows. *(i)* The incumbent has (and exploits) an informational advantage — he is the only to observe the state of the world. *(ii)* Since voters do not observe the state of the world, the incumbent can falsely report and not deliver the public project on the basis of, e.g., adverse economic conditions. *(iii)* While voters are exposed to the same informational flow,⁵ they own a different degree of political sophistication that they use to codify the incumbent’s message. *(iv)* Voters’ political sophistication is proportional to their stock of education. Then, I assume that well educated voters have more expertise in distinguishing a true statement from a lie in political communication.⁶

1979; see also Botero, Ponce, and Shleifer, 2014); more resistant to persuasive appeals (Scott, 1963; Chaiken and Baldwin, 1981) and less influenceable by the agenda setting power of the media (Iyengar, Peters, and Kinder, 1982); more persuaded by logic argument (Chaiken, 1980; Petty and Cacioppo, 1979); and more thoughtful to policy issues and less to the candidates’ personal traits in casting their vote (Miller and Miller, 1976; Wyckoff, 1980).

⁴The assumption of a fixed competence across politicians has been first advanced by Barro (1973) and Ferejohn (1986) to study an electoral accountability mechanism where voters punish incumbents at the elections if their operate is not such to deliver the voters’ reservation utility. Note, however, that this set-up is also important to capture the idea that, in many poor democracies, voters often do not have a real alternative and the challenger looks pretty much the same as the incumbent at their eyes.

⁵Several contributions have explored the role of information on voters’ political decisions (see, for a survey, Persson and Tabellini, 2002). In this paper, I hold this alternative channel fixed to study how variation in political sophistication among voters explains variation in voting and, ultimately, in the way constituencies discipline politicians.

⁶This assumption is in line and corroborated by several empirical contributions in political psychol-

(v) Finally, voters use an “awareness management” model (as in Bénabou and Tirole, 2002) to assess the reliance of the incumbent’s signal and use this assessment to cast their vote.⁷ A critical aspect of this set-up is then that, although voters receive the *same* message, they may have a different understanding of it.⁸

The two-period model accounts for two main mechanisms driving the political equilibrium. First, as in the classical Ferejohn’s (1986) framework, more education on average creates incentive for the incumbent to behave congruently with voters’ interest (i.e., cheat less) in order to gain re-election. This is because more educated workers invest more, increasing the incumbent’s continuation value. Second, educated voters are more effective in monitoring, forcing an incumbent with career concern to behave congruently with voters’ interest. The balance between these two forces determines the willingness of the incumbent to cheat the electorate, invest to a lesser extent in the public good, and extract rents.

Societies characterized by a low political ability are more likely to fall prey of bad politicians. These politicians manipulate relevant information to cheat the electorate, misappropriate public funds, do not provide public goods, and, *nonetheless*, obtain re-election. I discuss several implications of this equilibrium. First, relatively high sophisticated individuals may decide to keep their investment in education low or to not invest at all. This can be the case when they expect political deception. This in turn will keep down future political expertise and electoral accountability and may provide little incentive to the incumbent to behave well. Second, reforms such as auditing, that promotes full transparency, can successfully hinder cheating and promote investment in education by all individuals, rendering voters more sophisticated and politicians more likely to behave well.

These implications can provide insights on democratic consolidation processes when the two-period set-up is extended to an infinite horizon time span. I discuss potential dynamic complementarity that may arise between the sophisticated political accountability and the accumulation of education and wealth. This complementarity activates when

ogy. See, among others, Abramowitz, Lanoue, and Ramesh (1988), Sniderman, Glaser, and Griffin (1991), and Gomez and Wilson (2001).

⁷Bénabou and Tirole (2002) derive a game of self-deception in which an individual at time 1 (*self 1*) uses an “awareness management” model to assess the truthfulness of a certain memory that *self 0* may have an interest in suppressing. Here, I adapt this informational strategic interaction in a game of political deception.

⁸Another critical aspect of this set-up is that I abstract away from any specific institutional features. I rather take here a reduced-form approach where variations in the political sophistication of the constituency correlate with changes in democratic institutions.

initial conditions prompt an efficient monitoring of politicians in office that have in turn incentives to invest in the public project for gaining re-election. The public good fosters private investment in education, rendering future voters' requirements stricter and democracy consolidated over a long time horizon. The theory illustrates how this mechanism will potentially yield multiple steady states. They include a constituency with a low median level of education governed by corrupted politicians (a "poverty/ignorance trap") and a constituency with a high median level of education that supports honest politicians in office (a "self-sustaining growth" equilibrium).

The theory delivers important implications for how to address the so-called "democratic dilemma" (Lupia and McCubbins, 1998; Caplan, 2011, Dalton, 2013) — dilemma that refers to the mismatch between the requirements of a democracy and voters' ability to meet those requirements. To do so, it is appropriate to study the consolidation of a democratic regime using a framework where checks and balances are jointly determined with the degree of political sophistication of that particular constituency. A lack of coevolution between political norms and institutions, as well illustrated in Bidner and Francois (2013), Ticchi, Verdier, and Vindigni (2013), and Besley and Persson (2019), may result in a non-consolidation of the democratization process, not sufficiently supported by competent voters in accounting for the elected politicians' duties. The recent experiences in Iraq and Afghanistan, where democracy has been "exogenously" established by the intervention of a US-led coalition, are in line with our theory. In these democracies, voters' pluralistic prerogatives have proved to be low, whereas widespread electoral frauds have been reported. In the last part of the paper, I will discuss several examples of democracies that prove a quite heterogeneous monitoring setting and distinguish among unconsolidated, semi-consolidated, and consolidated democracies.⁹

While there is a widespread consensus that education plays a crucial role in politics and that higher levels of education go in the same direction of better political institutions (e.g. Barro, 1999; Murtin and Wacziarg, 2014; Fortunato and Panizza, 2015), there are few studies in economics that have investigated theoretical mechanisms that links the two. The general argument, pioneered by Verba and Nie (1972) and empirically tested by Botero, Ponce, and Shleifer (2014), goes as follows: more educated people are more literate, articulate, and knowledgeable — in sum, they are more productive in doing things, including complaining and reporting of politicians' misconduct. An alternative behavioral argument points out at the intrinsic motivational side of the most educated.

⁹On democratic consolidation, see Acemoglu and Robinson (2006, 2008).

Educated people are on average more prosocial, more willing to participate to the public life of the community, and more accustomed to civic involvements (Glaeser, Ponzetto, and Shleifer, 2007). In this paper I study the psychological components of the voter’s political participation as source of variation of political monitoring, present suggestive empirical evidence on it, and derive a political psychology theory where more educated voters use Bayesian rationality to spot and discipline dissonant politicians.

The results delivered by the model are complementary to a literature (e.g., Erlich and Lui, 1999; De la Croix and Delavallade, 2009; Eicher, García-Peñalosa, and van Ypersele, 2009) that study the macroeconomic implications of corruption and rent-seeking behavior in distorting individual economic decisions and potentially in driving off the path the evolution of economic growth described in Galor and Zeira (1993). None of them, however, discuss the implications for the consolidation of democracy, while the voting behavior is either absent or quite direct.¹⁰

The paper proceeds as follows. Section 2 provides further insights on the link between education and political sophistication. Section 3 describes the model and Section 4 studies its equilibrium and implications. In Section 5, I discuss the implications of the theory in an infinite horizon set-up. Section 6 concludes. Main proofs and several additional results are gathered in the Online Appendix.

2 Education and political sophistication

The link between education and political sophistication has been analyzed in depth by political and social psychologists (e.g., Abramowitz, Lanoue, and Ramesh, 1988; Sniderman, Glaser, and Griffin, 1991; Gomez and Wilson, 2001). According to these scholars, education offers and helps developing cognitive skills that may turn useful when individuals undertake decisions. In politics, education helps building political sophistication — i.e., the ability to distinguish a true statement from a lie in political communication. Sophisticated voters develop numerous, organized political cognitions; enumerate and compare potentially relevant considerations with better exhaustiveness; frame political issues in a more precise way; and foresee consequences of (reckless/populist) politicians’ behavior (e.g., Luskin, 1990).

¹⁰Eicher et al. (2009) is the only contribution in which workers also vote to reconfirm the incumbent party. However, as this was not their focal-point, they just assume that the re-election probability of a corrupt party is equal to the share of unskilled workers in the economy.

An important implication of this theory is that voters' beliefs on the quality of domestic political institution is likely to be a function of the educational level of that voter. In this section, I provide suggestive evidence on this link, by using individual level data from the World Value Survey (WVS) and country-level information on the quality of political institutions.

2.1 Data and empirical strategy

I analyze a specific question asked by the WVS in five waves (1980, 1990, 1995, 2000, and 2005): “*How much confidence do you have in the government? A great deal of confidence, quite a lot of confidence, not very much confidence, or no confidence at all*” (question E069_11). Question E069_11 is recoded so as higher values of it measure higher levels of confidence in the government. To capture variation in education across respondents, I codify question X025, *Highest educational level attained* in terms of three dummies as follows: $D_{Primary}$, $D_{Secondary}$, and $D_{Tertiary}$. Potential self-selection and omitted variable bias is addressed collecting a wide set of information on individual characteristics; these include gender, education, age, family status, income status, offspring, and the size of the city where the respondent currently resides.

Variation in the quality of political institutions is captured using membership status to the Organisation for Economic Co-operation and Development (OECD). The OECD sample includes 33 countries (54% of the total) that are among the world's most advanced; they also are among the best-functioning democracies. I construct and employ a dummy variable $OECD$ equals to 1 if the respondent lives in an OECD country. In alternative I employ the *polity index* (Jagers and Marshall, 2003) as a direct measure of politicians' congruence and show that results are robust to this second measure, which ranges from -10 (autocracy) to 10 (most democratic).¹¹

To test the direct relationship between voters' education, their confidence in the

¹¹It is worth remarking that the two measures are highly correlated. In 2005, for instance, 27 among the 33 OECD countries scored 10 on the polity index scale. Chile, France, and the Slovak Republic scored 9, Mexico and South Korea scored 8, and Turkey scored 7. In contrast, fewer than 1 in 14 *non*-OECD countries scored 10 on the polity index scale in 2005. Yet among these high-scoring countries, only Cyprus (in WVS 2005), Lithuania (in WVS 1995), Trinidad and Tobago (in WVS 2005), and Uruguay (in WVS 1995 and WVS 2005) are included in the World Value Survey. More than 43% of all *non*-OECD countries surveyed have a *negative* polity index.

government, and its “quality,” I estimate the following regression equation

$$\begin{aligned}\mathbb{E}[conf_govt_{icrt} \mid \cdot] = & \alpha_1 + \alpha_2 \overline{OECD} + \beta_1 D_{Primary_{icrt}} + \beta_2 D_{Tertiary_{icrt}} \\ & + \gamma_1 D_{Primary_{icrt}} \times \overline{OECD} + \gamma_2 D_{Tertiary_{icrt}} \times \overline{OECD} \\ & + \phi' \mathbf{X}_{icrt} + \delta_c + \mu_r + \theta_t;\end{aligned}\tag{1}$$

here i denotes an individual living in country c with religion r at time t . $\overline{OECD} = 1 - OECD = \{0, 1\}$ is a dummy variable — null if the respondent lives in a country that is an OECD member. I also introduce interaction terms between this status and the educational level of the respondent. The rest of the individual characteristics are gathered in the vector $\mathbf{X}_{icrt}$. This informational structure allows me to control for unobserved but fixed confounders that operate at a country level (captured by the inclusion of country dummies, δ_c) and also for those that operate at a cultural level (captured by the religion dummies, μ_r).¹² In addition, θ_t allows me to account for aggregate shocks that might have occurred during the interviews conducted in a specific WVS wave t .

My interest relies in the differences in beliefs about the government between individuals with same characteristics but living in two countries with different institutional settings. According to the above regression equation, the expected degree of confidence in an OECD government of a respondent with a primary education is $\alpha_1 + \beta_1$. That expected by her/his peer living in a non-OECD country is $\alpha_1 + \alpha_2 + \beta_1 + \gamma_1$. Their difference, $\alpha_2 + \gamma_1$, tells us how “same” low-educated persons react when the quality of political institutions changes. Similarly, $\alpha_2 + \gamma_2$, gives us a measure of the “same” high-educated persons reaction. If the link between education and political sophistication holds as stated above, one should expect high-educated voters to react to a higher extent to a change in the quality of political institution. Put it differently, high-educated voters show more elastic political beliefs, as a result of a high level of political sophistication. This translates into the following test: $\gamma_2 > \gamma_1$.

2.2 Results

Results are reported in column (1) of Table 1. Estimations are compared with the reference category — the constant, α_1 — that represents an adult single female with

¹²I introduce religion dummies to capture variation within the culture of the respondents (see Guiso et al., 2003), part of which is also captured by specific country features. To avoid bias in the estimation, all religions comprising fewer than 200 respondent members are grouped together as “other”. As a result, 24 religion dummies are included in the model, including the residual one.

Table 1: Correlation between confidence in the government, education, and “quality” of political institutions.

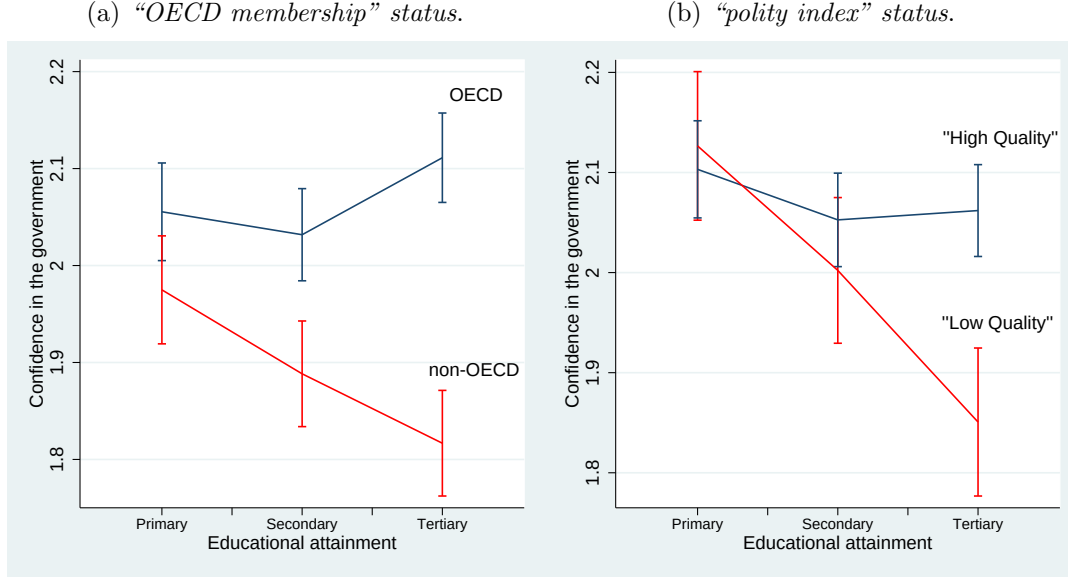
	Dependent variable is: “ <i>confid. in the gov.</i> ”		
	(1) full sample	(2) only democracies	(3) full sample
<i>Primary</i>	0.024 (0.012)	0.023 (0.012)	0.050*** (0.008)
<i>Tertiary</i>	0.079*** (0.012)	0.078*** (0.012)	0.009 (0.008)
<i>Primary</i> $\times$ $\overline{OECD}$	0.063*** (0.014)	0.044** (0.015)	
<i>Tertiary</i> $\times$ $\overline{OECD}$	−0.151*** (0.015)	−0.119*** (0.015)	
$\overline{OECD}$	−0.143*** (0.033)	−0.117*** (0.034)	
<i>Primary</i> $\times$ <i>Low Quality</i>			0.074*** (0.017)
<i>Tertiary</i> $\times$ <i>Low Quality</i>			−0.161*** (0.020)
<i>Low Quality</i>			−0.050 (0.030)
Constant	2.032*** (0.024)	2.015*** (0.025)	2.053*** (0.024)
<i>N</i>	112,170	87,787	107,022
<i>R</i> ²	0.157	0.118	0.164

Notes: Robust standard errors are reported in parentheses. All specifications include individual controls (age, gender, family status, income status, having a son, and size of the city where respondent lives) as well as country, religion, and World Value Survey wave dummies. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

no offspring with a secondary education and average income (lower middle class) that resides in a city with more than 100,000 inhabitants located in the United States. Their peers that live in a non-OECD country are, on average, significantly less confident in their government ($\hat{\alpha}_2 < 0$).

This comparison is illustrated in Figure 1(a), which sums up the six focal parameters in Table 1 and their values reported in column (1). Each point estimation is accompanied by a colored vertical bar that draws confidence interval at 95% level. Red is associated to OECD countries. Blue is for non-OECD countries. Figure 1(a) shows that differences *between* low-educated respondents in the degree of confidence in their government are

Figure 1: Patterns of political belief across variously educated individuals



Notes: (a) Patterns of political belief across variously educated individuals for OECD countries (in blue) and non-OECD countries (in red). (b) Patterns of political belief across variously educated individuals for countries with $polity2 \geq 0$ (in blue) and countries with $polity2 < 0$ (in red). Colored bars represent confidence intervals at 95% level.

not statistically significant. On the contrary, individuals with a tertiary education who live in an OECD country are, on average, significantly more confident in the government than their peers who live in a non-OECD country. Specifically, $\hat{\gamma}_2 - \hat{\gamma}_1 = 0.213 > 0$ and the associated F -test is 178.21.

Results displayed in column (1) also indicate no significant difference across variously educated individuals living in an OECD country in their level of confidence in the government. Within a non-OECD, on the contrary, well-educated individuals report a significant lower degree of confidence in their government than their low-educated peers. This is likely to hint evidence for political sophistication possessed by individuals with high educational attainment.

Columns (2) and (3) of the table report robustness checks of the main analysis presented in column (1). Column (2) restricts the sample by considering only those respondents living in a democracy. Accordingly, as in Persson and Tabellini (2003), countries with negative “polity index” values are dropped. This leaves us with a sample of 47 countries.¹³ This sample restriction does not materially affect the main results.

¹³Andorra, Belarus, Hong Kong, and Puerto Rico are not coded by the Polity IV project and hence-

Because the distribution of the “quality” of political institutions has been truncated (in the lower tail) for the non-OECD sample, I observe a reduced average distance in between OECD and non-OECD respondents’ degree of confidence in the government ($\hat{\alpha}_2$ is now smaller); moreover, the slope of the non-OECD pattern—that is, the steepness of the red line in Figure 1(a)—is also reduced (both $\hat{\gamma}_1$ and $\hat{\gamma}_2$ are closer to zero).

Column (3) uses a complement measure of political institutions quality—directly using variation in the *polity index*. Specifically, we split the country sample in “Low Quality” (those with *polity2* < 0) and “High Quality” countries (those with *polity2* ≥ 0). Patterns of political belief across variously educated individuals for the two country types are drawn in Figure 1(b). Estimations confirm the validity of our hypothesis ($\hat{\gamma}_2 - \hat{\gamma}_1 = 0.235 > 0$ with the *F*-test equals to 129.88) — in general, the *effects* of individual educational attainment on confidence in the government remain qualitatively largely unchanged — as do the *elasticities* of political beliefs held by individuals with different levels of education.

To summarize, in developed countries well-educated individuals realize that political institutions work well; hence their questionnaire responses reveal that they are more confident in the government than are citizens with only a primary education. In contrast, well-educated individuals in developing countries are aware of dissonant politicians; hence their responses indicate less confidence (than do the responses of their less educated fellow citizens) in the government. Yet poorly educated individuals are barely aware of political machinations, so their beliefs are not (or just barely) affected by the “quality” of political institutions.

A potential concern of this analysis is that well-educated individuals typically have a lower cost in acquiring political information, so that awareness may be born out from knowledge rather than cognitive skills. In Table C1, in appendix, I show that this is unlikely. I gather additional information on how frequently media outlet are utilized to gather information by the respondent. As this set of questions are only asked during wave 5 of the WVS (i.e., 2005 circa), I restrict the baseline analysis to that wave only (reported in column 1 of Table C1). Column (2) of Table C1 controls the baseline regression for whether the respondent has read a daily newspaper at least once during the week prior the interview. Column (3) controls for whether the respondent has watched news programs on radio or TV during the week prior the interview. Results do not change qualitatively and indicate that the pattern between education and political

forth are omitted from this analysis.

beliefs holds even if one keeps fixed the purchase of relevant information.

In the remainder of this paper I describe a political-economic model where education yields cognitive skills that make political accountability more effective.

3 The model

This section introduces a two-period career concern model in which a politician incumbent trades off the opportunity to run for a second mandate with the opportunity to extract rents in period 1. Central to this model is the voters' level of political sophistication which sums up their ability and effectiveness to monitor and discipline rent-seeker politicians. I first introduce players' technology and preferences. Then, I discuss the inferential process voters use to detect non-credible politicians' messages. Since voters are producers and live in a democratic regime, I will interchangeably use the terms voters, producers, and citizens. The timing of events is also introduced. To simplify notation, I drop the time subscript for actions taken in period 1.

3.1 Set-up

A country with national wealth y is populated by a continuum of measure one of voters and an incumbent politician, I , that governs the constituency. The incumbent is appointed to accomplish a specific task — namely, to implement a public project (or a reform), productive and complementary to the private producers' activity. The project is indivisible and the incumbent just decides whether to provide it or not. I denote this decision as $G = \{0, 1\}$. In period 2, the same decision is denoted by $G_2 = \{0, 1\}$. At the end of period 1, voters assess the incumbent conduct and decide whether to retain or replace him with a challenger in a democratic election. Let us denote this voters' decision as $\varphi = \{0, 1\}$. Since I am interested in rent-seeking behavior and in explaining its variation across countries, I assume that politicians are equally competent and that voters vote retrospectively casting their vote on the basis of the incumbent's honesty. As I clarify below, the incumbent is replaced with a challenger of equal competence if he does not meet the voters' requirement in terms of honesty.

Office guarantees to the incumbent rents specified as follows:

$$U^I = T - BG + \varphi\beta(T_2 - B_2G_2), \quad (2)$$

where $T = \tau y$ and $T_2 = \tau_2 y_2$ represent the tax revenues collected in period 1 and in period 2, respectively. Citizens pay taxes, at the rate τ and τ_2 , to benefit from the public project which entails a production cost of $B > 0$, entirely carried on by the incumbent. The government budget constraint is $B \leq T$ in period 1 and $B_2 \leq T_2$ in period 2. Alternatively, I refer to the cost of the public project in terms of share of revenues, that is as $B = bT$ and $B_2 = b_2 T_2$. The government budget constraint implies that $b \in [0, 1]$, as well as $b_2 \in [0, 1]$,¹⁴ that might alternatively be interpreted as the weight of the project on the country's public budget, or, in a broader sense, consistent with Ehrlich and Lui (1999), as the extent of government intervention in the economy.

Using this notation, I define $(1 - bG)T$ as current rents and $\varphi\beta(1 - b_2G_2)T_2$ as the rents expected in period 2 from being re-elected. The politician in office therefore maximizes the expected two periods flow of rents expressed under Equation 2. Note that, as typical in standard career concern models, future rents, discounted at the usual rate $\beta > 0$, are contingent on voters' electoral decision (φ). Henceforth, if the incumbent loses the election he receives a null payoff in period 2.

The incumbent legislates over a continuum of risk-neutral citizens of unit mass. Citizens are endowed with different initial educational levels, $e^i \geq 0$, and distribute according to the law $F(e^i)$. Although the distribution of citizens is initially exogenous, citizen i 's second period stock of education, e_2^i , is determined by an expansion in education, $h^i \geq 0$, but may also depreciate at the rate $\delta \in [0, 1]$:

$$e_2^i = (1 - \delta)e^i + h^i. \quad (3)$$

Note from Equation (3) that education cannot be financed by borrowing money but can only be expanded through educational investments.¹⁵ Finally, I assume that this educational expansion costs $\phi^{-1}(h^i)^\phi$, with $\phi \geq 2$.¹⁶

In each period, each citizen transforms the stock of education, e^i and e_2^i , in income, y^i and y_2^i , using the same Cobb–Douglas technology in which both education and the public project are complementarily employed. Note that the assumption of complementarity is crucial for the theory and it is introduced for capturing voters' attention on the

¹⁴Under this alternative form, Equation (2) becomes $U^I = (1 - bG)T + \varphi\beta(1 - b_2G_2)T_2$.

¹⁵This is similar to assume imperfect credit markets as in Galor and Zeira (1993). This assumption allows to study educational investments under liquidity traps and makes the incumbent's decision more salient for the poor.

¹⁶In order to obtain analytical results, I suppose that investing is equally costly for all citizens, even though the most educated ones could be expected to exert less effort in learning.

incumbent behavior.¹⁷ Moreover, I assume that G affects productivity in period 2 and not period 1's in which I suppose that the economy starts with an allocation of income proportional to the stock of education received: $y^i = (e^i)^\alpha$, where $\alpha > 0$ is the education elasticity on income. In period 2, the production function is therefore given by:

$$y_2^i = G(e_2^i)^\alpha. \quad (4)$$

The average and total income is $y = \int_0^1 y^i di$, in period 1, and $y_2 = \int_0^1 y_2^i di$, in period 2. Finally, each citizen uses the post-tax income, $(1 - \tau)y^i$ in period 1 and $(1 - \tau_2)y_2^i$ in period 2, for consumption and to finance the expansion of education, h^i , in period 1:

$$U^i = (1 - \tau)y^i - \frac{1}{\phi}(h^i)^\phi + \beta(1 - \tau_2)y_2^i. \quad (5)$$

3.2 Beliefs and cognitive process

Since my aim is studying the sophisticated electoral accountability process I add to this simple career concern model uncertainty and Bayesian sophistication. First, I assume that the state of the world $\sigma = \{L, H\}$ fluctuates around a low and a high state. In the low state ($\sigma = L$) the project cannot be provided — even if the incumbent would like to.¹⁸ Therefore, I impose $G^L = 0$. If the state is high ($\sigma = H$) the public project faces no exogenous obstacles so that G^H can be either 0, if the incumbent decides to not provide the project (even if he can), or 1, if the incumbent does provide it.

Second, I assume that the politician in office has an informational advantage with respect to the voters. The state σ is only observed by the incumbent politician, while voters only own a prior q on the event that $\sigma = H$ — in other words, $q = P(\sigma = H)$.

Third, I assume that voters observe whether the incumbent has delivered the public project or not. Note that observing $G = \{0, 1\}$ is informative on the state of the world: when they observe that the politician in office carries on the investment (i.e. $G = 1$) they receive a signal $\tilde{\sigma} = H$; conversely, when they observe $G = 0$ they receive a signal

¹⁷Complementarity between education and the public project is the mechanism through which voters' political accountability maps into their economic productivity. Obviously, if citizens' productivity was independent on the incumbent's decision of implementing the public project, voters would not pay any attention on politicians' behavior—who would systematically extract rents and set $G = 0$. This case is arguably uninteresting for the theory. The literature on the complementarity between private and public goods in endogenous growth models is vast. See, for instance, Barro (1991) and Barro and Sala-i-Martin (1992).

¹⁸This might be, for example, because tax revenues must be entirely used for other unproductive purposes — exogenous to the incumbent's decision.

$\tilde{\sigma} = L$. This set-up implies that voters observe the message $\tilde{\sigma}$, but cannot verify its credibility as σ is unknown.

Fourth, to study how political sophistication binds politicians' behavior, I assume that voters own a different degree of political sophistication that they use to codify the incumbent's message, $\tilde{\sigma}$. A voter with a given degree of political sophistication therefore uses a different cognitive process to assess whether the incumbent reports truthfully σ . I define this degree as $\eta^i = \frac{e^i}{\bar{e}}$, where $\bar{e}$ denotes the educational level that a person could ideally achieve.¹⁹ The individual degree of political sophistication can then be interpreted as a measure of how relatively educated a person i is with respect to such an ideal person.

The idea behind variation of η^i across individuals is that less well educated voters have low expertise to distinguish a true statement from a lie in political communication: well educated voters are generally knowledgeable about politics; they follow it closely; understand who stands for what politically. They get informed — devotedly reading newspapers and following news regarding the major issues of the day, both national and international. Less well educated voters, conversely, are generally hardly overburdened by the amount of time devoted to public affairs and, specifically, to politics. In newspapers they just look at sport pages and care next to nothing to politics. Because of it, they form only a grip on who stands for what politically.²⁰

It is therefore not implausible to suppose that well educated voters approximate Bayesian reasoning while less well educated voters are more credulous and process political messages using shortcuts. With this illustrative purpose, I can now distinguish between two extreme types of voters:

- $\eta^i = 1$ (i.e., $e^i = \bar{e}$) represents the ideal case of a perfect Bayesian voter with full political sophistication. I refer to this type as the fully sophisticated voter.
- $\eta^i = 0$ (i.e., $e^i = 0$) represents the case of a fully naïve voter, who believes that the state of the world is always just as announced by the incumbent.

¹⁹More precisely, I define $\bar{e}$ as the minimum of the set of maximum values of e^i , i.e., $\forall \varepsilon = \int_{\bar{e}}^{\infty} f(e^i)de^i > 0$, $\bar{e} := \min(e^i : \lim_{\varepsilon \rightarrow 0}(e^i - \bar{e}) = 0)$. In view of its ideal nature, I assume its value does not evolve.

²⁰A vast literature on political psychology has tackled the study of voting behavior and described the causal mechanisms through which personal characteristics affect voting decision of a person. Specific works that focused on the role of education as a cognitive device in politics, and to which I closely relate, are Abramowitz, Lanoue, and Ramesh (1988), Sniderman, Glaser, and Griffin (1991), and Gomez and Wilson (2001).

Note, however, that the model accounts for a continuum of voters and that $\eta^i \in [0, 1]$. Its distribution is a rescaling of $F(e^i)$.

Finally, in the same spirit of Bénabou and Tirole (2002), I assume voters are aware of the incentives politicians in office have in cheating the electorate — i.e., voters are aware that in the high state the incumbent can falsely report σ (calling for exogenous reasons) and not deliver the project.²¹ Formally, let $\lambda \in [0, 1]$ denote the likelihood that the incumbent reports truthfully σ . I define this likelihood as the *congruence rate* of the incumbent. Note that λ is an action the incumbent optimally chooses in equilibrium. I say that a politician acts congruently with the voters' interests if, in equilibrium, he picks a high λ . Since, as I shall explain below, in equilibrium rent extraction is engendered by low values of λ I interchangeably refer to dissonant politicians as rent-seekers, corrupt, or dishonest ones.

When voters observe that the project has not been delivered (i.e., they receive $\tilde{\sigma} = L$), they ask themselves whether the lack of public investment is indeed due to exogenous factors (i.e., $\sigma = L$) or rather is the result of dissonant behavior of the incumbent (i.e., $\sigma = H$). However, the way each voter computes the cognitive process to answer such question is sensibly different among different sophisticated persons. If voter i thinks the incumbent acts congruently with probability

$$P^i(\tilde{\sigma} = H \mid \sigma = H; \lambda, \eta^i) = 1 - (1 - \lambda)\eta^i, \quad (6)$$

she will use the following “awareness management” model to assess the reliability of $\tilde{\sigma} = H$:

$$\begin{aligned} p^i(\lambda, \eta^i, q) &:= P^i(\sigma = H \mid \tilde{\sigma} = L; \lambda, \eta^i) \\ &= \frac{(1 - \lambda)\eta^i q}{1 - q + (1 - \lambda)\eta^i q}. \end{aligned} \quad (7)$$

Speculatively, I derive the probability that the incumbent is, for voter i , a credible sender as $1 - p^i(\lambda, \eta^i, q)$.²²

²¹On the other hand, note that $\sigma = L$ always leads to $\tilde{\sigma} = L$. When the state is low, in fact, the provision of the project is not possible. From the incumbent's objective function, Equation (2), it directly follows that producing the project (i.e., falsely reporting $\tilde{\sigma} = H$) would only entails a deadweight loss equals to its cost B . Anticipating this, each voter i forms the following same subjective probability that the incumbent may act congruently in the low state: $P^i(\tilde{\sigma} = L \mid \sigma = L) = 1$.

²²In Table C2 in the Online Appendix I report a contingency table to derive Equation (7). In Appendix E I additionally derive a number of posterior distributions in societies with a different initial distribution of η , using Equation (7).

Crucially, note that the subjective probability that the incumbent reports truthfully (i.e., Equation 6) depends on both λ and η^i . I assume voters observe the congruence rate but can misjudge situations because of their lack of sophistication. In other words, even if voters have enough information on the ‘type’ of the incumbent, voters can commit mistakes because of their lack of capacity in linking λ with $\tilde{\sigma}$. Fully naïve voters believe that $P^i(\tilde{\sigma} = H \mid \sigma = H; \eta^i = 0) = 1$, regardless of λ . In words: voters with no political expertise are fully credulous and always think the incumbent acts in the constituency’s interest, providing the public project in the high state. On the other hand, fully sophisticated voters correctly guess that the probability that the incumbent acts congruently is in line with what they guess is the congruence rate, as $P^i(\tilde{\sigma} = H \mid \sigma = H; \lambda, \eta^i = 1) = \lambda$. Midway, there is a mass of voters who, despite are aware of the congruence rate λ of the politician, can commit mistakes because of their lack of political expertise.

Looking closer at Equation (7) one realizes that it satisfies the Spence-Mirrlees condition, i.e. that higher types, η^i , are more responsive to a given increase in λ . So, if voter i , with η^i , thinks the congruence rate has increased he will readjust more quickly his guess over $p^i(\lambda, \eta^i, q)$ than voter j with $\eta^j < \eta^i$.²³ Finally, note that $p^i(\lambda, \eta^i, q)$ also crucially increases with the prior q : having a strong prior over $\sigma = H$ (a high q) makes voters to believe that the incumbent falsely reported $\tilde{\sigma} = L$ (and hence cheated); a weak prior over $\sigma = H$ (a low q) makes voters to believe that the incumbent truthfully reported $\tilde{\sigma} = H$.

3.3 Timing of events

The political game is played around two periods. Here I detail the timing of events, starting from period 1.

- Period 1:

T1 The state of the world $\sigma = \{L, H\}$ is revealed to the incumbent. Each citizen i is endowed by a stock of education e^i .

T2 Each citizen i pays taxes and invests h^i in education, without observing the state of the world, σ .

²³In Section D of the Online Appendix, I discuss and present additional features of Equation (7) and the implications of the Spence-Mirrlees condition. Note that this is consistent with the empirical evidence presented in Section 2.

T3 The incumbent observes citizens' investments and sets the congruence rate, $\lambda \in [0, 1]$. Accordingly, he decides whether to make the public investment, $G = \{0, 1\}$.

T4 Observing or not the project signals voters the state of the world (i.e., $\tilde{\sigma} = \{L, H\}$). Conditional on the signal received, voters assess its reliability and decide whether to retain the incumbent or replace him with the challenger (i.e., $\varphi = \{0, 1\}$).

- Period 2:

T5 Voters receive their second period income y_2^i and pay taxes τ_2 . The elected candidate, either the incumbent or a newcomer, receives rents, $T_2 = \tau_2 y_2$, and decides whether to provide the project, G_2 . If not reelected the incumbent receives a null payoff.

Note from the timing above that all the citizens are exposed to the same informational flow — they receive the same signal $\tilde{\sigma}$. However, while the most sophisticated are more aware of the incentive of the politician in office to cheat the electorate, the less sophisticated are credulous and use to a lower extent Bayesian inference to corroborate their decisions.

I solve the model by backward induction for the Bayesian Perfect Equilibrium (PBE) of the political game. The PBE is defined as a triple $(\hat{\lambda}, \hat{h}^i, \hat{\varphi})$ where citizens' private investments are optimal, given the incumbent's cheating strategy, the cheating strategy of the incumbent is optimal, given voters' assessment of the reliability of the political signal and the electoral accountability constraint, and where voters assess the reliability of the political signal using Bayes' rule and the incumbent's cheating strategy.

4 Analysis

4.1 Period 2

At the end of period 2, the game ends. Therefore, the elected politician optimally decides to not provide the project and pocket the entire amount of tax revenues in period 2, $T_2 = \tau_2 y_2$. Note that this is an equilibrium irrespective of the state of the world $\sigma = \{L, H\}$. Therefore, $\hat{\lambda}_2 = 0$, $\hat{\sigma}_2 = L$, and $\hat{G}_2 = 0$.

4.2 Elections and sophisticated electoral accountability

At the end of period 1, elections are held and citizens vote retrospectively — that is, according to the evidence they have collected after having received the message $\tilde{\sigma}$.²⁴ To characterize the voting equilibrium I introduce the following *Bayesian evidence function*:

$$\mathcal{E}(p^i) \equiv \log \left(\frac{p^i}{1 - p^i} \right). \quad (8)$$

$\mathcal{E}(p^i)$ is defined as a logit function of p^i , the subjective probability that, for voter i , the incumbent behaved dishonestly when selected G , as expressed in (7).²⁵ The logic behind (8) is that if voter i , in view of the message $\tilde{\sigma}$ received, judges the event that the incumbent cheated as more likely than that in which he reported truthfully, then we say, using Bayesian jargon, that voter i collects more evidence about the incumbent falsely reporting.

Following this lead, I assume that each voter i votes in favor of the incumbent reappointment if she does not collect more relative evidence in favor of the event that the incumbent acted dishonestly. This voting equilibrium occurs when

$$\mathcal{E}(p^i) \leq 0. \quad (9)$$

Rearranging (8) and (9) yields that voter i votes for the reappointment if $p^i(\lambda, \eta^i, q) \leq 1/2$.

Finally, to derive the voting equilibrium I apply a simple majoritarian rule in democratic regimes. Accordingly, if the majority of voters has not enough evidence in favor of the event that the incumbent acted dishonestly (i.e., if $p^i(\lambda, \eta^i, q) \leq 1/2$) then the incumbent is re-elected. Formally, this statement holds for

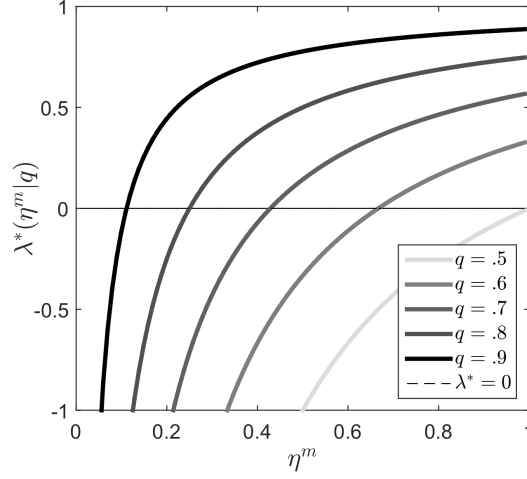
$$\int_0^{1/2} f(p^i) dp^i \geq \frac{1}{2}, \quad (10)$$

where $f(p^i)$ is the density of voters with belief equals to p^i . Now, denote the belief held by the median voter as $p^m(\lambda, \eta^m, q) := P^m(\sigma = H \mid \tilde{\sigma} = L; \lambda, \eta^m)$. By definition,

²⁴Since competence is fixed across candidates, incumbent's past behavior is the only relevant information voters can use. Note that this is central to the theory: by keeping politicians' competence fixed, I can singling out the effect of past behavior on the formation of voters' beliefs which in turn determines the strength of their requirement.

²⁵On Bayesian decision theory see, for example, Jaynes (2003, Chapter 4).

Figure 2: Congruence $\lambda^*(\eta^m, q)$ as a function of the median voter's level of political sophistication, for a given prior q .



$\int_0^{p^m} f(p^i) dp^i := 1/2$; it follows that

$$\int_0^{1/2} f(p^i) dp^i \geq \frac{1}{2} = \int_0^{p^m} f(p^i) dp^i \iff p^m \leq \frac{1}{2}. \quad (11)$$

That is to say, in equilibrium, the incumbent is re-elected ($\hat{\varphi} = 1$) if the median citizen believes that he cheated the electorate. I summarize this first result in the following proposition.

Proposition 1 (Voting Equilibrium) *Let $p^m(\lambda, \eta^m, q) := P^m(\sigma = H \mid \tilde{\sigma} = L; \lambda, \eta^m)$. Then the following statements hold.*

(i) *If $p^m(\lambda, \eta^m, q) \leq \frac{1}{2}$, then the median voter sets $\hat{\varphi} = 1$.*

(ii) *If $p^m(\lambda, \eta^m, q) > \frac{1}{2}$, then the median voter sets $\hat{\varphi} = 0$.*

Using expression (7) in (11) yields the following condition — what I define the *sophisticated electoral accountability constraint* faced by an incumbent with career concerns:

$$\lambda \geq \lambda^*(\eta^m, q) := 1 - \frac{1}{\eta^m} \left(\frac{1-q}{q} \right). \quad (12)$$

Condition (12) simply states that if the incumbent seeks re-election he has to be congruent enough — specifically, his congruent rate cannot lie below the threshold $\lambda^*(\eta^m, q)$.

The set containing any values of $\lambda \in [\lambda^*(\eta^m, q), 1]$, therefore, represents the set of admissible congruence rates for an incumbent seeking reelection.

Let us focus now for clarity on the implications for the incumbent of the setting rule (12). In Figure 2 I draw a family of curves $\lambda^*(\eta^m, q)$ that vary along the x-axis with η^m . Each curve is then drawn for five different values of q , from $\frac{1}{2}$ to $\frac{9}{10}$. Despite the value of q , Figure 2 shows that the threshold $\lambda^*(\eta^m, q)$ moves up as η^m moves rightward. So in more politically sophisticated society — where the majority of voters achieve a higher level of political expertise, η^m — the election winner, incumbent has to be more congruent. In politically unsophisticated societies with a low value of η^m , however, λ^* could be so small that the incumbent feels himself unconstrained. In fact, notice that, for values of η^m closed to zero, $\lambda^*(\eta^m, q)$ tends to minus infinity. To account for this I constrain it below at zero. The set of admissible congruence rates for an incumbent seeking reelection is therefore given by:

$$\max [0, \lambda^*(\eta^m, q)] \leq \lambda \leq 1. \quad (13)$$

I summarize these results in the following lemma:

Lemma 1 (Sophisticated Electoral Accountability) *The voting equilibrium sustains a sophisticated electoral accountability given by (12) that is increasing in the median voter's level of political sophistication, η^m .*

As a final remark, note that the curves $\lambda^*(\eta^m, q)$ move upward as q shifts up. The intuition behind it is that a strong prior on $\sigma = H$ makes harder for the incumbent to convince the median voter that the state is actually $\tilde{\sigma} = L$. Thereby, if citizens are certain about the realization of the high state (i.e., $q = 1$) there is no scope for the incumbent to behave dishonestly. The threshold, in fact, reduces to $\lambda^*(\eta^m; q = 1) = 1$, for any η^m .

By the same token, if citizens are very confident about the realization of $\sigma = L$ (a low q) there is no need for monitoring the incumbent. Intuitively, from Equation (13) we have that $\lambda^*(\eta^m; q < \frac{1}{2}) < 0$ if $q < \frac{1}{2}$; in this particular case, the median voter acknowledges that the failure of the project provision cannot be attributed to the incumbent's will. In other words, the distinction between q and λ allows the voter to separate exogenous causes from causes directly attributable to the incumbent. Only the second ones are used against or in favor of his re-election.

4.3 The accumulation process

I now turn on the accumulation process carried out by each citizen i at T2. As the timing in Section 3.3 indicates, the decision on h^i in expanding education is determined without observing the public investment. Hence, the only information citizens use is their beliefs on σ (i.e., q) and their conjecture on whether the public investment will be carried out or not.

Figure 3 illustrates such conjecture. We can distinguish among four cases. If the state of the world is low ($\sigma = L$), the incumbent will decide whether to report truthfully, and announce $\tilde{\sigma} = L$, or falsely, announcing $\tilde{\sigma} = H$. However, each citizen i is aware that in this state the incumbent has no incentive to cheat; so each of them think that $P^i(\tilde{\sigma} = L \mid \sigma = L) \times 0 + P^i(\tilde{\sigma} = H \mid \sigma = L) \times 1 = 1 \times 0 + 0 \times 1 = 0$. If the state is high ($\sigma = H$), cheating will be an option for the politician. Each citizen i , therefore, thinks that the incumbent will cheat according with Equation (6). If she believes the incumbent will behave dissonantly, she also thinks that the incumbent will set $G = 0$. Therefore, $P^i(\tilde{\sigma} = L \mid \sigma = H) \times 0 = 0$. Finally, if believed congruent, the public investment is expected to be carried out. Hence, using Equation (4), I can now derive the expected output that each citizen i produces in period 2 as:

$$\begin{aligned} \mathbb{E}(y_2^i) = & \left\{ P(\sigma = L) [P^i(\tilde{\sigma} = L \mid \sigma = L) \times 0 + P^i(\tilde{\sigma} = H \mid \sigma = L) \times 1] + \right. \\ & \left. + P(\sigma = H) [P^i(\tilde{\sigma} = L \mid \sigma = H) \times 0 + P^i(\tilde{\sigma} = H \mid \sigma = H) \times 1] \right\} (e_2^i)^\alpha, \end{aligned} \quad (14)$$

that reduces to the following equation:

$$\begin{aligned} \mathbb{E}(y_2^i) &= P(\sigma = H) P^i(\tilde{\sigma} = H \mid \sigma = H) (e_2^i)^\alpha \\ &= q [1 - (1 - \lambda) \eta^i] (e_2^i)^\alpha. \end{aligned} \quad (15)$$

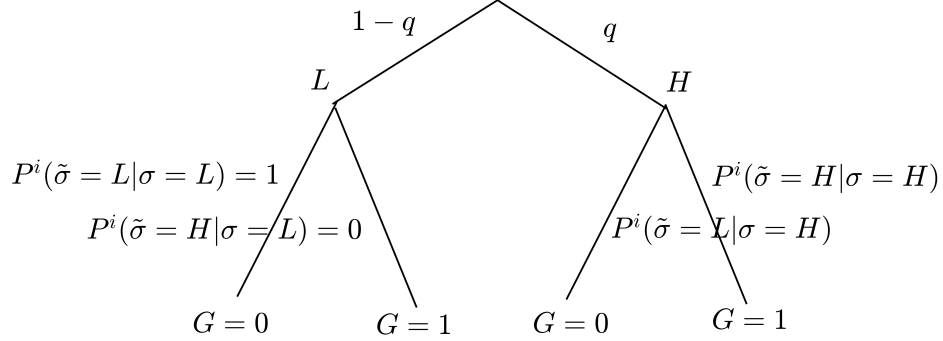
Substituting (15) into (5) and maximizing it with respect to h^i gives the following first order condition:

$$\Omega (1 - (1 - \lambda) \eta^i) [(1 - \delta) e^i + \hat{h}^i]^{\alpha-1} = (\hat{h}^i)^{\phi-1}, \quad (16)$$

where $\Omega := \alpha \beta q (1 - \tau_2) \leq 1$ is a parameter that collects all the factors favoring educational expansion.²⁶ Equation (16) equalizes marginal benefit, in the left-hand side, to the marginal cost, in the right-hand side, of expanding education up to the optimal $\hat{h}^i$

²⁶ $\Omega \leq 1$ is a sufficient condition for the second order condition to hold.

Figure 3: Schematic illustration of the i 's cognitive process tree.



level. Rearranging (16) yields the following relation:

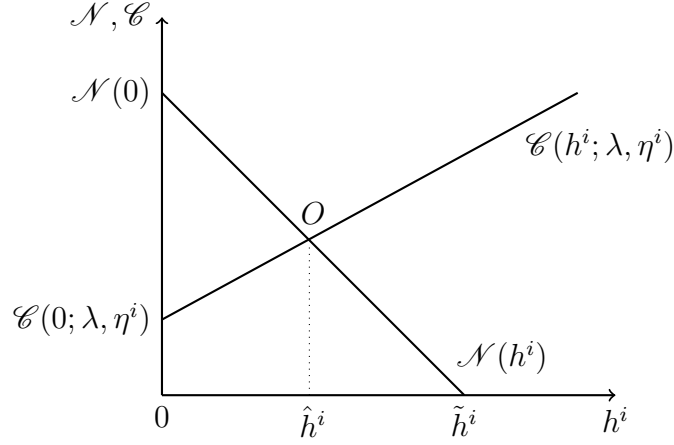
$$\underbrace{\Omega[(1-\delta)e^i + \hat{h}^i]^{\alpha-1} - (\hat{h}^i)^{\phi-1}}_{\mathcal{N}} = \underbrace{\Omega(1-\lambda)\eta^i[(1-\delta)e^i + \hat{h}^i]^{\alpha-1}}_{\mathcal{C}}. \quad (17)$$

Equation (17) well describes the *trade-off* that, in equilibrium, each citizen i faces between investing and perceiving political deception, in a country in which the incumbent is thought to not act as a *perfect agent*, seeking rents by cheating his constituency.

The first term on the left-hand side of Equation (17) represents the usual net marginal benefit from investing h^i units in education. I denote this term as $\mathcal{N}(h^i)$. Through this accumulation channel, each individual would invest up to the point in which $\mathcal{N}(h^i) = 0$. At this point, investment is optimal because the marginal cost from investing equalizes its marginal benefit from producing income in period 2. I call this first best solution $\tilde{h}^i$. The second term on the right-hand side of Equation (17) is the *marginal cost of deceptive politics*. I denote this term as $\mathcal{C}(h^i; \lambda, \eta^i)$. It tells us how much of the investment in education is perceived as lost at the margin when politician in office is thought to behave dishonestly. This marginal cost increases with h^i as more investments would be drawn off by the incumbent in the form of rents for the same value of λ .

I illustrate the equilibrium in Figure 4. Figure 4 depicts the first best equilibrium where each agent i , endowed with an educational level e^i , invests $\tilde{h}^i$, and the actual (second-best) optimal expansion of education when the individual i internalizes the cost of deceptive politics, $\hat{h}^i$. Clearly, $\tilde{h}^i \geq \hat{h}^i$; when the agent expects the incumbent to behave dishonestly she reacts by underinvesting in equilibrium. Deceptive politics therefore entails a deadweight loss which amounts to the area of the triangle $O\hat{h}^i\tilde{h}^i$, but it is evident from Equation (17) that this area depends on what the incumbent's

Figure 4: The trade-off between investing and perceiving political deprivation.



congruence rate is, λ , and on the level of political sophistication of the citizen i , η^i .

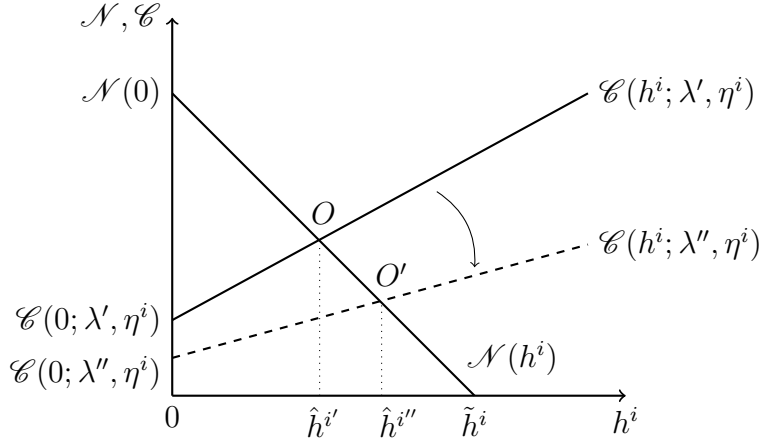
To clearly highlight the intuition behind the cost of deceptive politics, consider first the case in which the incumbent will act fully congruently (i.e., $\lambda = 1$). From (6) we have that each citizen i always believes that the incumbent will report truthfully, regardless of the state of the world (σ) and her own level of political sophistication (η^i). The right hand side in Equation (17) reduces to zero and $\mathcal{C}$ gets flat along the x-axis in Figure 4. The case in which the incumbent acts honestly is therefore that in which there is no political distortion and no underinvestment ($\hat{h}^i \equiv \tilde{h}^i$). Consider now the case in which the incumbent will act fully deceptively (i.e., $\lambda = 0$). In this case, political costs are maximal; yet they account for variation across individuals, according to the level of political sophistication η^i , and within each individual i , as more investments mean more losses at the margin.

In Figure 4a I generalize this argument, illustrating what happens to the equilibrium, O , if the incumbent will behave more congruently. A shift of λ , from λ' to λ'' , moves the marginal cost of deceptive politics downward to $\mathcal{C}(h^i; \lambda'', \eta^i)$, the dashed line, which intersects the marginal net benefit line, $\mathcal{N}(h^i)$, at a new point O' . In correspondence of the new equilibrium, citizen i , with η^i , invests more and expands her educational level up to $\hat{h}^{i''}$. The new equilibrium is still suboptimal (i.e. $\hat{h}^{i''} \leq \tilde{h}^i$); nevertheless, it induces citizens to invest more as they expect being more productive in period 2. Accordingly, the deadweight loss shrinks from the area of the triangle $O\hat{h}^{i'}\tilde{h}^i$ to that of the triangle $O'\hat{h}^{i''}\tilde{h}^i$.

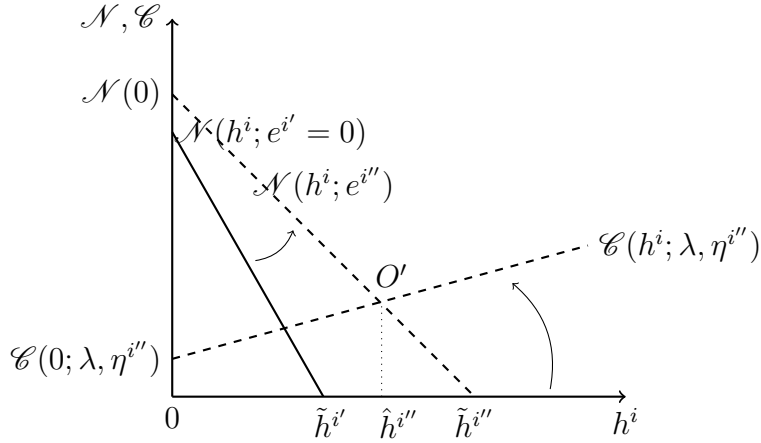
Likewise, in Figure 4b, I compare the equilibrium in (17) for two individuals with

Figure 5: Comparative statics.

(a) An increase in congruence rate, from λ' to λ'' .



(b) An increase in political sophistication, from $\eta^{i'}$ to $\eta^{i''}$ ($\eta^{i'} = 0$).



different stocks of education. Specifically, I compare an individual i' with no education ($e^{i'} = 0$) with another one, say i'' , with a positive level. Since the first is illiterate I refer to her as a fully naïve citizen (i.e., $\eta^{i'} = 0$). The second citizen instead owns a certain degree of political sophistication (i.e., $\eta^{i''} > 0$). λ is rather held fixed at an intermediate value. This exercise allows me to singling the political psychology mechanism, operating through a rotation of $\mathcal{C}(h^i; \lambda, \eta^i)$, out of the classical accumulation one, that works through an upward turn of $\mathcal{N}(h^i; e^i)$.

The fully naïve citizen never perceives any political cost — as she is not aware of the incentive of the politician to cheat. $\mathcal{C}(h^i; \lambda, \eta^{i'} = 0)$ therefore coincides with the x-axis

in Figure 4b. The right hand side in Equation (17) is null, for this individual i' , and the equilibrium is given by $\tilde{h}^{i'}$ in Figure 4b when $\mathcal{N}(h^i; e^{i'} = 0)$ intersects the x-axis. Any increase in education (from $e^{i'} = 0$ to $e^{i''} > 0$) has a double simultaneous effect on both the two sides of Equation (17). $\mathcal{N}(h^i; e^i)$ rotates upward as this, by Equation (3), increases the accumulation of education in period 2. Because the net marginal benefit from expanding education increases, this would lead citizen i'' to invest up to $\tilde{h}^{i''}$. However, with the increase in education individuals gain political sophistication and, by this mean, get aware of the possibility that the incumbent might not be fully congruent. Since $\lambda > 0$, citizen i'' starts perceiving political costs that at the margin are equal to $\mathcal{C}(h^i; \lambda, \eta^{i''})$. In other words, $\mathcal{C}(h^i; \lambda, \eta^i)$ rotates upward so that the new equilibrium is not given by $\tilde{h}^{i''}$ but by $\hat{h}^{i''}$ when $\mathcal{N}(h^i; e^{i''})$ intersects $\mathcal{C}(h^i; \lambda, \eta^{i''})$ (point O' in Figure 4b). Note that $\hat{h}^{i''} < \tilde{h}^{i''}$: because of the political sophistication channel the more sophisticated citizen (i'') perceives a deadweight loss equals to the area of the triangle $O'\hat{h}^{i''}\tilde{h}^{i''}$ that is rather null for fully naïve citizens (such as i').

4.4 The political process

In this section I explore the following political mechanism: how do politically sophisticated voters bind the incumbent's propensity to be dissonant and misappropriate public budget?

At time T3 of the high-state game the incumbent decides whether to deliver the public project or not. In doing so, he faces the following inter-temporal trade-off. On the one hand, congruence creates incentives for voters to invest in education. Such investments, in turn, reflect in relatively higher expected future rents. Hence, this channel self-disciplines the incumbent to behave congruently with the voters' interest. On the other hand, as in standard career concern models, current rents are delivered to the politician regardless of his behavior in period 2 and can be increased by behaving dissonantly. When incentives to behave congruently are low, a high sophisticated society can motivate the incumbent by threatening an electoral punishment.

This trade-off is resolved by solving the following maximization problem, which is constrained by Equation (13), the sophisticated electoral accountability constraint the incumbent anticipates at T3:

$$\max_{\lambda} U^I(\lambda) = (1 - q\lambda b)\tau y + \beta \mathbb{E}\{U_2^I(\lambda)\} \quad \text{s.t.} \quad \lambda \geq \lambda^*(\eta^m, q). \quad (18)$$

$U_2^I(\lambda)$ is the expected flow of rents the incumbent expects in period 2, discounted at the usual rate β . This flow is the tax revenue collected in period 2, i.e. the product of the tax rate τ and the national wealth. This last quantity is derived in appendix (see Section A.1) in a closed form analytical solution that makes use of three additional assumptions: a fixed education elasticity of income production, a fixed convexity rate of the cost of expanding education,²⁷ and a log-normal distribution of education.²⁸

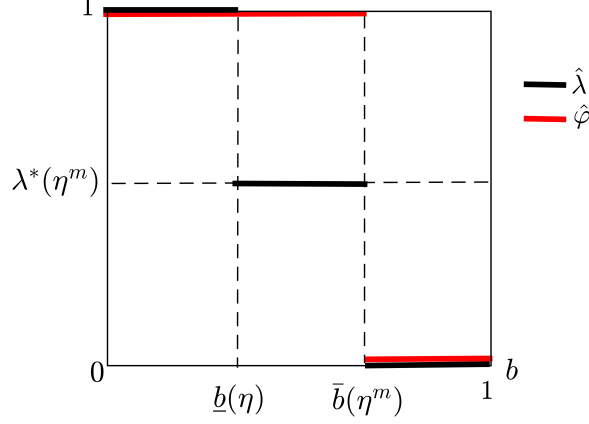
The solution of (18) thus compares the expected future marginal benefit of being congruent and its current marginal cost, and is unique, given the awareness management model voters use to assess the political signal. The solution is derived in Appendix A.1 and clearly depends on the cost of the project, b . The relationship between $\hat{\lambda}$ and b is graphically illustrated in Figure 6, that underlines three main regions. Specifically, when this cost is low enough, say $b < \underline{b}(\eta)$, the incumbent has little incentive to behave dissonantly. Because the cost of producing the project is low (relative to the national wealth), he can conveniently provide the project that boosts the investments among the most sophisticated citizens. This enlarges his expected rents in period 2, T_2 , as much as λ approaches to 1. Hence in this region, the equilibrium is such that the incumbent plays $\hat{\lambda} = 1$ (the black line) and, because his behavior meets the voters' requirement, the median voter in return plays $\hat{\varphi} = 1$ (the red line).

If $b \geq \underline{b}(\eta)$ the public project becomes relatively *costly* and, as a result, an *hit-and-run* strategy more profitable. This is the case in which current rents are more attractive than those expected in period 2. In this region, thereby, the incumbent has incentive to fully extract current rents by setting $\hat{\lambda} = 0$. In equilibrium, the median voter sets $\hat{\varphi} = 0$. In this framework, however, the incumbent has another possibility — specifically, he can give to the median voter exactly what she expects (i.e., $\hat{\lambda} = \lambda^*(\eta^m, q)$) and remain for a second mandate (i.e., $\hat{\varphi} = 1$). Below, I show that this is a stable political equilibrium if

²⁷I set for convenience, $\alpha = 2$ as well as $\phi = 2$, that governs the convexity of the cost of expanding education. From Equation (16) it is intuitive to see that this particular case coincides with the one in which the individual marginal benefit as well as the marginal cost of expanding education are both linear in h^i . This case is the most parsimonious setting that allows me to depart from the classical Galor and Zeira's (1993) set-up (where the individual marginal benefit of expanding education is an increasing function of the investments due to imperfect credit markets) and to disentangle the political psychology mechanism from the classical accumulation one.

²⁸Specifically, I assume citizens to distribute log-normally in terms of education, that is $\ln e^i \sim \mathcal{N}(\mu, \Delta^2)$, a modeling choice that strictly follows Glomm and Ravikumar (1992) and Benabou (1996, 2000, 2002) and it is highly consistent with the empirical distribution of income. Therefore, I denote the average level of education in the economy as $e := \mathbb{E}(e^i) = \exp(\mu + \Delta^2/2)$, where $\mu \geq 0$ and $\Delta > 0$ are the location and scale parameters of the log-normal distribution $\ln e^i$. Recall that in a log-normal distribution the median is $\eta^m = \exp(\mu)/\bar{e}$. Since $\Delta > 0$, then $\eta > \eta^m$.

Figure 6: Political equilibrium for different values of b .



and only if the constituency owns a low level of political sophistication (i.e., η^m is low).

To see that I compare the incumbent's utility under full extraction ($\hat{\lambda} = 0$) and not reelection ($\hat{\varphi} = 0$) with the one in which he sets $\hat{\lambda}$ so as to meet the voters' requirement. Using the sophisticated electoral accountability constraint (13), this is equivalent to compare $\ln U^I(\hat{\lambda} = 0)$ and $\ln U^I(\lambda^*)$. The comparison gives rise to a second threshold, $\bar{b}(\eta^m)$, which defines the maximum relative cost of the public project that the incumbent is prone to bear for meeting the voters' requirement while having the incentive of fully extracting rents. This result is illustrated in Figure 6. When $\underline{b}(\eta) \leq b \leq \bar{b}(\eta^m)$, the incumbent optimally trades off a part $1 - \lambda^*(\eta^m, q)$ of the current rents with future rents that come from maintaining office. Since the incumbent is in line with the sophisticated electoral accountability constraint the median voter, as in the first region, decides to re-elect the incumbent for the next mandate (i.e. $\hat{\varphi} = 1$).

The political equilibrium here is however substantially different from that I obtained in the region where $b < \underline{b}(\eta)$. In the first region, the incumbent acts as a “perfect agent” as both the incumbent and the electorate have the same incentives: boosting the accumulation process. In the second region, incentives are no longer aligned and the median voter attempts to discipline the incumbent through a sophisticated electoral accountability. In countries with a low median level of education however this political accountability process is not very effective and, as a result, the political equilibrium features voters' manipulation (i.e., a low level of $\hat{\lambda}$).

This conclusion leads us to a first result of this paper: a politician in office manipulates voters' beliefs according to the extent to which the electorate is “manipulable.” When the majority of voters is politically naïve (i.e. for low level of η^m) the incumbent

picks a low level of congruence, $\hat{\lambda}$. In contrast, in more politically sophisticated societies (i.e. with high level of η^m) the incumbent optimally chooses to be congruent, picking a high level of $\hat{\lambda}$. I summarize this result in Proposition 2.

Proposition 2 (Political equilibrium) *Let $\ln e^i \sim \mathcal{N}(\mu, \Delta^2)$ and $B = bT$, with $b \in [0, 1]$. There exists $\underline{b}(\eta)$, increasing in η , and $\bar{b}(\eta^m)$, decreasing in η^m , and with $0 \leq \underline{b}(\eta) \leq \bar{b}(\eta^m) \leq 1$, such that:*

- (i) *If $b < \underline{b}(\eta)$, then the incumbent plays $\hat{\lambda} = 1$ and the median voter plays $\hat{\varphi} = 1$.*
- (ii) *If $b \in [\underline{b}(\eta), \bar{b}(\eta^m)]$, then the incumbent plays $\hat{\lambda} = \lambda^*(\eta^m) = 1 - \frac{1}{\eta^m}(\frac{1-q}{q})$ and the median voter plays $\hat{\varphi} = 1$.*
- (iii) *If $b > \bar{b}(\eta^m)$, then the incumbent plays $\hat{\lambda} = 0$ and the median voter plays $\hat{\varphi} = 0$.*

Proof. See Appendix A.1. ■

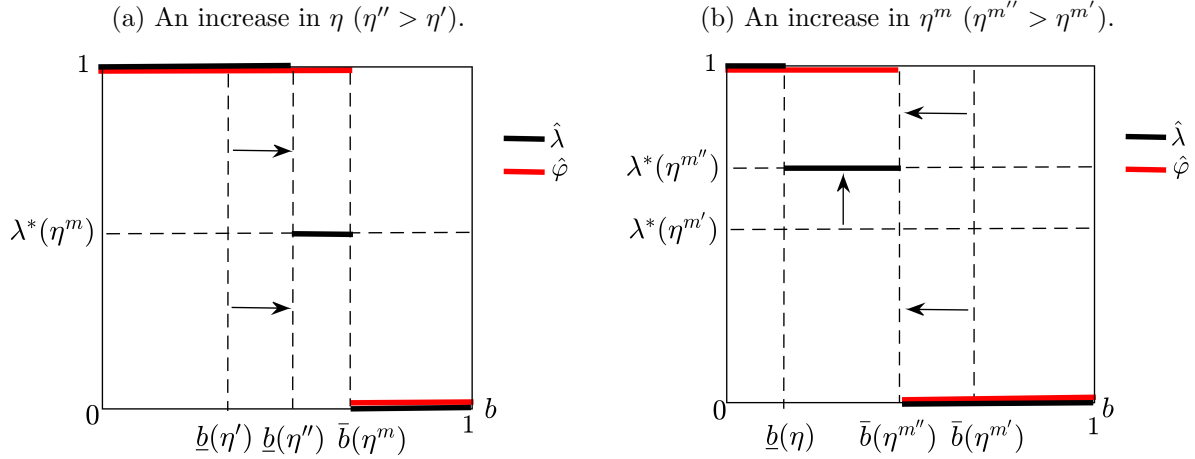
4.5 Policy: income shock, education reform, and auditing

Proposition 2 clearly indicates that political deception is more likely when the cost of the project is high. However, its nefarious effects are limited in high sophisticated societies. In this section, I discuss three policy implications of the model: income shock, education reforms, and auditing.

Income shock. How is political deception affected by an income shock? Suppose, for example, that a technological shock increases the education elasticity on income, α , for the most skilled workers. The shock leaves behind the low segment of income distribution, generating an increase in the mean η while the median η^m remains approximately stable. As discussed above, an upward shift in η self-disciplines the incumbent to behave congruently with the voters' interest. This is illustrated in Figure 6a that shows that electoral manipulation becomes less frequent in equilibrium as $b(\eta)$ moves rightward. An income shock that benefits a segment of the population can thus spillover to the rest of the population through a less frequent political deception. In the new equilibrium, as $\hat{\lambda}$ is (on average) higher, all the workers invest more, thus improving the political sophistication in the future.

Education reform. The stock of education attained by the constituency governs the incentives of the ruler to cheat. An important question is thus whether an education

Figure 7: The effect of a variation in the mean (Panel a) and the median (Panel b) of education on the political equilibrium for different values of b .



reform can help societies in disciplining politicians. Consider an education reform that targets the low segment of the distribution. This can be done, for example, by reducing ϕ , the cost of investing in education, for the least educated citizens. As the low tail of the distribution moves up, so does the median level. Suppose for simplicity that the mean level remains still;²⁹ the leverage of η^m on the political equilibrium is twofold and is illustrated graphically in Figure 6b. First, a more sophisticated society makes the equilibrium in which voters are manipulated less likely. In fact, an increase in η^m determines a shift to the left of $\bar{b}(\eta^m)$, making more likely that in equilibrium the incumbent picks a *hit-and-run* strategy when b is high. Thus, the second region shrinks while the third (in which $\hat{\lambda} = 0$ and $\hat{\phi} = 0$) enlarges. Second, an increase in η^m determines a simultaneous upward move of $\hat{\lambda} = \lambda^*$. In Figure 6b this is traced by a shift of the black line from $\lambda^*(\eta^{m'})$ up to $\lambda^*(\eta^{m''})$, for $\eta^{m'} < \eta^{m''}$. Therefore, electoral manipulation is less frequent as well as less profitable, as $\hat{\lambda}$ has to be higher as the price of re-election.

Auditing. Suppose now that auditing is promoted making information on public works fully transparent. An effective auditing, that releases information to voters through public media, equalizes to a scenario in which all the voters (irrespective to

²⁹This exercise is similar to what have been done in Castelló-Climent (2008) empirically, using cross-country data on a large panel of states worldwide. Castelló-Climent finds that an increase in the median of the distribution of education across countries is associated with an increase in the quality of democracy (captured by the Freedom House Political Rights Index) even controlling for the average level of education.

their own level of political expertise) can successfully link λ to σ . In this scenario, the incumbent cannot therefore manipulate voters' beliefs. It follows that in the region $b \in [\underline{b}(\eta), \bar{b}(\eta^m)]$, $\hat{\lambda} = 1$. The effect is thus similar to the income shock discussed above, but the expansion of $\underline{b}(\eta)$ is maximal. It is also worth noting that as the second region is typically the most deceptive in countries where political sophistication is low, the gain from auditing can be substantially higher in those societies.

5 Long-run implications

The above framework can be easily extended to an infinite horizon one where the continuation value of the incumbent is made up of a flow of rents that in each period t the incumbent receives for remaining in office. This flow enlarges with time, if the economy embraces an equilibrium path consistent with growth and efficient political monitoring, or shrinks if the economy gets trapped in a path with low growth and a systematic rent-seeking behavior of its representatives. Central to this is therefore the evolution of education and its co-evolution with political accountability.

While I remind the interested reader on a formal model presented in Appendix B, it is important to remark here a couple of key features and implications of this extended framework. The evolution of the economy is governed by three state variables: (i) the state of the world, $\sigma_t = \{H, L\}$, that is independently and identically distributed and is revealed at the beginning of each period t only to the politician in office; (ii) the individual stock of education that enlarges with investments but can depreciate at the rate δ ; and (iii) the cost of the public project that is drawn independently and identically distributed at the beginning of each period.

Intuitively, the initial distribution of education is central for its evolution. Initially high educated societies are rather likely to start with region $b_t < \underline{b}(\eta_0)$. Because $\Delta e_{t+1}^i \geq 0$, $\underline{b}(\eta_t)$ moves steadily to the right making a lucky draw (i.e., $b_t < \underline{b}(\eta_t)$) even more likely in the future. Over a long horizon, the accumulation rate enlarges and so its wealth.

Initially low educated societies are likely to start their path on the left of $\underline{b}(\eta_0)$. Whether $\Delta e_{t+1}^i \geq 0$ or $\Delta e_{t+1}^i < 0$ critically depends on the education of the median voter — i.e., on whether a complementarity between political sophistication and electoral accountability is capable of turning on. When the median voter is well educated, political monitoring is effective so that politicians with career concerns are forced to implement the public project as the price for re-election. Despite the initial low level of

education, the society can nonetheless embark in a welfare-enhancing trajectory thanks to the sophisticated electoral accountability. Note that this process is irreversible as the political accountability becomes more sophisticated over time and so the mean, that grows thanks to the public investments. When the median voter is less well educated, political monitoring is not effective. Politicians in office never provide the public project, despite they have career concerns, so that the accumulation of education and wealth steadily decreases.

Thus complementarity between political sophistication and electoral accountability can help societies to consolidate their democratic institutions. A consolidated democracy is able to effectively monitor appointed politicians and firmly punish dissonant ones. Even if $b \in [\underline{b}(\eta), \bar{b}(\eta^m)]$, consolidated democracies force politicians to set in equilibrium $\hat{\lambda} = 1$ thanks to a highly political sophisticated median voter. The cost of the public project is, therefore, neutral to the political equilibrium and corruption never emerges. This type of democracies includes mainly OECD rich countries in which levels of corruption are stably low and education largely disseminated across citizens, but may also describe successful cases in the last century that include developing countries such as, for example, Mauritius or Costa Rica.³⁰

A semi-consolidated democracy is able to fully incentivize appointed politicians when $b < \underline{b}(\eta)$, but does not possess sufficient political sophistication to effectively monitor and punish dissonant politicians when the economy switches to the region in which $b \in [\underline{b}(\eta), \bar{b}(\eta^m)]$. This type of democracies are then characterized by the highest variability in the behavior of elected politicians that may be consistent with the appointment (and re-election) of populist and corrupt politicians along the way. Latin American democracies make a good example of it. While these countries are relatively rich, their level of inequality is unmatched and so is its educational system divided between poor public schools and expensive private ones that only wealthy students can afford. According to the model predictions, strong deceptive political forces may then emerge when η^m is

³⁰As discussed in Eicher et al. (2009), Mauritius represents an exceptional case of economic success sustained by a high institutional and political quality. This country gained independence from the British Empire in 1967, and started its course with an unusual high level of human capital that engendered subsequent institutional reforms (Subramanian and Roy, 2003). Similarly, immediately after its independence from the Spanish Empire, Costa Rica adopted an educational reform that introduced a free and compulsory public school system that now places the country educational system at the top level in Latin America (see http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2013-14.pdf). Along with the educational achievements, the country developed a stable and well functioning democracy as well as a moderate level of corruption comparable to that of Spain (see https://www.transparency.org/news/feature/corruption_perceptions_index_2016).

low, deteriorating the accumulation path. Corruption is, in fact, quite recurrent, and projects that involve a large amount of resources (high b) are often tarnish with scandals of corruption.³¹

Finally, an unconsolidated democracy systematically fails in delivering economic compatible incentives to politicians as well as in monitoring their behavior. According to the theory, these countries arrived to the democracy too soon—without those factors that, in the words of Lupia and McCubbins (1998), favor the matching between the requirements of a democracy and voters’ ability to meet those requirements. These are generally poor countries, with a low η as well as Δ , that frequently fall within the second region—the worst one for democracies with a very low η^m . These countries are often democracies “exogenously” established. Recent notable examples are Iraq and Afghanistan—two democracies established in the aftermath of the intervention of a US-led international coalition that freed them from long-lasting dictatorships. In both the two countries, elected representatives only take advantage of their position to seek rents and corruption is at the highest level around the world.³² Moreover, education is rather low in Afghanistan with a literacy rate that is about 38% (24% if one considers only females) while in Iraq it is higher (about 79%).³³

6 Conclusions

This paper delineates a theoretical framework to study and explore the multifaceted mechanisms that spring from education in determining the success of a democracy. In the theory, education specifically acts as a cognitive tool that voters may use to decode the informational content of political signals. This mechanism adds up to the human capital effect that makes more educated producers also more skilled in the production process. The two mechanisms complexly interact in the model, generating persistent trajectories that potentially end up in multiple equilibria. However, productivity and,

³¹A salient example is represented by big scandals of grand corruption that involved the Presidents of the Federal Brazilian governments in the last two decades. Luiz Inácio Lula da Silva and Dilma Rousseff were both implicated in the Petrobras scandals, while Michel Temer himself, a center right politician who becomes the interim president for the remainder of the legislature, is accused of taking \$5 million in bribes from a food company. See the article “Brazil faces fresh turmoil after President Temer charged with corruption,” *The Guardian*, June 27, 2017.

³²According to the Corruption Perception Index, Iraq and Afghanistan ranked in 2016 as the tenth and the eighth country with the highest level of perceived corruption, respectively. See https://www.transparency.org/news/feature/corruption_perceptions_index_2016.

³³See the World Factbook, CIA.

henceforth, citizens' welfare may increase with education, via the sophisticated electoral accountability channel, even if education has no direct effect on productivity, via the human capital accumulation channel. This second nexus, although realistic, is not necessary for the paper story but it only strengthens results by defining virtuous or wicked political paths that crucially depend on the initial distribution of political sophistication in the society.

The theory advances a rationale for the rising of electoral manipulation in a political communication game in which dynamic complementarity arises. The non-linear interplay of the human capital accumulation process and the electorate degree of political sophistication generates different sets of economic incentives and political constraints. A copious human capital accumulation provides politicians with incentives to stay in office and act congruently with the electorate interests. When the accumulation process is rather scarce, politicians rise their payoffs by exploiting current rents, which are proportional with electoral manipulation. The theory however shows how manipulation can be blocked when the electorate is sufficiently sophisticated—a process I have defined *sophisticated electoral accountability*.

The model is only partially consistent with the modernization theory. On the one hand, education is crucial in shaping democratic institutions via the sophisticated electoral accountability channel. More educated societies are indeed more able in monitoring politicians that, in turn, invest more in productive public goods that foster private investment in education boosting future accountability. On the other hand, however, initially low educated societies systematically fail in monitoring, and, even worst, corruption is found to be persistent due to a persistent low level of electoral accountability. This point has strong implications in young democracies where voters are (on a median level) poorly sophisticated, providing room for rent seeking politicians to easily manipulate the electorate. By focusing on the voters' characteristics, and specifically on their level of political sophistication, the theory shows how the democratization process is substantially an *endogenous* process—hardly one imposed by outside forces.

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Online Appendix

Sophisticated Electoral Accountability

By Alessandro Belmonte

A Proofs

A.1 Proof of Proposition 2

A.1.1 Derivation of the national wealth

From the assumption of log-normality, i.e. $\ln e^i \sim \mathcal{N}(\mu, \Delta^2)$, it follows immediately that also the period 1 income, $y^i = (e^i)^2$, distributes log-normally with mean

$$m = 2\mu + \Delta^2, \tag{A1}$$

and variance v^2 . Formally, we have that $\ln y^i \sim \mathcal{N}(m, v^2)$.

In period 2, the accumulation process of education follows the law of motion described in Equation (3) computed in equilibrium:

$$e_2^i = (1 - \delta)e^i + \hat{h}^i, \tag{A2}$$

where the expression of $\hat{h}^i$ is given by the solution in (17). From the assumption of linear marginal costs and benefits (i.e., from assuming $\alpha = 2$ and $\phi = 2$), the first order condition in (17) reduces to

$$\hat{h}^i(e^i; \lambda) = (1 - \delta) \left[\frac{\Omega(1 - (1 - \lambda)\eta^i)}{1 - \Omega(1 - (1 - \lambda)\eta^i)} \right] e^i. \tag{A3}$$

Substituting $\hat{h}^i(e^i; \lambda)$ into Equation (3) yields the equilibrium stock of education that each citizen i has at her disposal in period 2:

$$\hat{e}_2^i(e^i; \lambda) = \frac{1 - \delta}{1 - \Omega(1 - (1 - \lambda)\eta^i)} e^i. \tag{A4}$$

Taking a logarithmic transformation of $\hat{e}_2^i(e^i; \lambda)$ yields:

$$\begin{aligned}\ln \hat{e}_2^i &= \ln e^i + \ln(1 - \delta) - \ln(1 - \Omega(1 - (1 - \lambda)\eta)) \\ &\approx \ln e^i - \delta + \Omega - \Omega(1 - \lambda)\eta.\end{aligned}\tag{A5}$$

for small values of δ and $\Omega(1 - \lambda)\eta$. Since $\ln e^i \sim \mathcal{N}(\mu, \Delta^2)$, it follows that $\ln \hat{e}_2^i$ distribute normally as well, where the average level of education in period 2 is obtained by averaging Equation (A5) as follows:

$$\hat{\mu}_2 = \mu + \frac{\Delta^2}{2} + (\Omega - \delta) - \Omega(1 - \lambda)\eta.\tag{A6}$$

By the same token, one can compute the output that each citizen i expects in period 2; taking a logarithmic transformation of (14) yields:

$$\begin{aligned}\ln \hat{y}_2^i &= 2 \ln \hat{e}_2^i + \ln(1 - (1 - \lambda)\eta) + \ln(q) \\ &\approx 2 \ln \hat{e}_2^i - (1 - \lambda)\eta + \ln(q).\end{aligned}\tag{A7}$$

Taking the average:

$$\begin{aligned}\hat{m}_2 &= 2\hat{\mu}_2 - (1 - \lambda)\eta \\ &= 2\mu + \Delta^2 + 2(\Omega - \delta) - 2\Omega(1 - \lambda)\eta - (1 - \lambda)\eta \\ &= m + 2(\Omega - \delta) - (1 + 2\Omega)(1 - \lambda)\eta.\end{aligned}\tag{A8}$$

Equation (A8) represents the national wealth that the constituency has collected after the expansion of education in period 1 and it is a sufficient statistics for social welfare.

A.1.2 Solution of Equation (18)

At the stage T2 of period 1 the incumbent decides the optimal degree of congruence, λ , and accordingly the message $\tilde{\sigma}$ and whether to provide the public project or not, G . He does so solving the following Bellman Equation:

$$\max_{\lambda} U^I(\lambda) = (1 - q\lambda b)\tau y + \beta\tau_2\mathbb{E}(\hat{y}_2),\tag{A9}$$

subject to the sophisticated electoral accountability constraint:

$$\lambda \geq \lambda^*(\eta^m, q).$$

Taking a logarithmic transformation of Equation (18) yields:

$$\begin{aligned}\max_{\lambda} \ln U^I(\lambda) &= \ln\{(1 - q\lambda b)\tau y\} + \beta \ln\{U_2^I(\lambda)\}, \\ &= \ln \tau + \ln y + \ln(1 - q\lambda b) + \beta \ln \tau_2 + \beta \ln \hat{y}_2.\end{aligned}\tag{A10}$$

Using Equation (A1) and (A8) we obtain, for small values of $q\lambda b$, the following expression:

$$\begin{aligned}\max_{\lambda} \ln U^I(\lambda) &\approx \ln \tau + m - q\lambda b + \beta \ln \tau_2 + \beta \hat{m}_2 \\ &= \ln \tau + 2\mu + \Delta^2 - q\lambda b + \beta \ln \tau_2 + 2\beta\mu + \beta\Delta^2 \\ &\quad + 2\beta(\Omega - \delta) - \beta(1 + 2\Omega)(1 - \lambda)\eta.\end{aligned}\tag{A11}$$

The expression in Equation (A11) links the incumbent's two periods rents, $U^I(\lambda)$, and his congruence rate, λ , as a log-linear relationship. The first order condition is given by:

$$\frac{\partial \ln U^I(\lambda)}{\partial \lambda} = \beta(1 + 2\Omega)\eta - qb = 0.\tag{A12}$$

Since $\ln U^I(\lambda)$ is linear in λ it is immediate to see that if the incumbent's marginal benefit of acting congruently, $\beta(1 + 2\Omega)\eta$, outweighs his marginal cost, qb , then the corner solution is $\hat{\lambda} = 1$. On the contrary, if the incumbent's marginal cost of acting congruently, qb , outweighs his marginal benefit, $\beta(1 + 2\Omega)\eta$, then the corner solution is $\hat{\lambda} = 0$.

Solving Equation (A12) with respect to the relative cost of the public project, b , yields threshold $\underline{b}(\eta)$ defined as follows:

$$\underline{b}(\eta) := \frac{\beta}{q}(1 + 2\Omega)\eta.\tag{A13}$$

Note that if $b < \underline{b}(\eta)$ then the marginal benefit of acting congruently is higher than its marginal cost, i.e. $\frac{\partial \ln U^I(\lambda)}{\partial \lambda} > 0$. Thereby, the incumbent always sets $\hat{\lambda} = 1$ and, because this behavior meets the voters' requirement, the median voter optimally sets $\hat{\varphi} = 1$. This gives point (i) of Proposition 2.

Conversely, if $b \geq \underline{b}(\eta)$ then the marginal benefit of acting congruently is lower than its marginal cost, i.e. $\frac{\partial \ln U^I(\lambda)}{\partial \lambda} \leq 0$. The incumbent therefore compares two different strategies: he can give to the median voter exactly what she expects, $\hat{\lambda} = \lambda^*(\eta^m; q)$, and remain for a second mandate (i.e., $\hat{\varphi} = 1$), or, if it is too costly, sets $\hat{\lambda} = 0$. In the latter

case, he will not gain re-election: $\hat{\varphi} = 0$.

If the incumbent sets $\hat{\lambda} = \lambda^*(\eta^m; q)$, his two periods rents is as follows:

$$\begin{aligned} \ln U^I(\lambda^*) &= \ln \tau + 2\mu + \Delta^2 - q\lambda^*b + \beta \ln \tau_2 + 2\beta\mu + \beta\Delta^2 \\ &\quad + 2\beta(\Omega - \delta) - \beta(1 + 2\Omega)(1 - \lambda^*)\eta, \end{aligned} \quad (\text{A14})$$

where the expression of λ^* is given in Equation (12). In Equation (A14) it is immediate to see that the incumbent's private cost decreases with λ^* , while the social cost of political deception are increasing with it, $\beta(1 + 2\Omega)(1 - \lambda^*)\eta$. Political deception therefore results in a transfer of cost from politicians to citizens.

If the incumbent rather sets $\hat{\lambda} = 0$, he will not be re-elected; so his rents reduce to his period 1 rents:

$$\ln U^I(0) = \ln \tau + 2\mu + \Delta^2. \quad (\text{A15})$$

It is intuitive that the incumbent sets $\hat{\lambda} = 0$ if and only if $\ln U^I(0) > \ln U^I(\lambda^*)$. Using Equation (A14) and (A15), and solving for b yields threshold $\bar{b}(\eta^m)$ defined as follows:

$$\bar{b}(\eta^m) := \frac{\beta}{q\lambda^*} [\ln \tau_2 + 2\mu + \Delta^2 + 2(\Omega - \delta) - (1 + 2\Omega)(1 - \lambda^*)\eta], \quad (\text{A16})$$

which is a function of η^m as λ^* is so. Substituting Equation (12) into (A16) we obtain the following expression for $\bar{b}(\eta^m)$, monotonically decreasing in η^m :

$$\bar{b}(\eta^m) := \beta \frac{\ln \tau_2 + 2\mu + \Delta^2 + 2(\Omega - \delta) - (1 + 2\Omega) \exp(\frac{\Delta^2}{2})}{q - (1 - q) \frac{1}{\eta^m}}. \quad (\text{A17})$$

Note that if $b \leq \bar{b}(\eta^m)$ then the strategy of acting dissonantly while running for a second mandate always dominates the strategy of *hit-and-run*, i.e. $\ln U^I(0) \leq \ln U^I(\lambda^*)$. Thereby, the incumbent always sets $\hat{\lambda} = \lambda^*(\eta^m; q)$ and, because this behavior meets the voters' requirement, the median voter optimally sets $\hat{\varphi} = 1$. This gives point (ii) of Proposition 2.

Finally, if $b > \bar{b}(\eta^m)$ then the strategy of *hit-and-run* always dominates manipulation, i.e. $\ln U^I(0) > \ln U^I(\lambda^*)$. Thereby, the incumbent always sets $\hat{\lambda} = 0$ and, because this behavior does not meet the voters' requirement, the median voter optimally sets $\hat{\varphi} = 0$. This gives point (iii) of Proposition 2.

B An infinite-horizon model

In the paper, I have focused on a set-up in which citizens and politicians live for two periods. A natural limitation of it is that it cannot deliver further insights regarding dynamic complementarity between political accountability and the accumulation of education and wealth. In this section, I show as this complementarity arises when initial conditions prompt an efficient monitoring of politicians in office that in turn invest in the public project for gaining re-election. The public good fosters private investment in education, rendering future electoral accountability even more sophisticated and democracy consolidated over a long time horizon.

B.1 The extended framework

To obtain a theory of democratic consolidation then this section expands the previous set-up assuming that citizens and politicians have an infinite horizon. Time evolves discretely from $t = 0$ and, in every period t , citizens pay taxes and decide the individual educational expansion, h_t^i . The incumbent selects the congruence rate λ_t and, accordingly, decides whether to provide the public project, G_t . After the public project is observed, the median voter additionally decides whether to retain the incumbent or not, φ_t . I assume that the incumbent cannot be re-elected if previously removed from office. Voters use the same awareness management model, described in Section 3.2, to assess the reliability of the incumbent's signal.

The state variables of the economy are two: the state of the world, $\sigma_t = \{H, L\}$, that is revealed at the beginning of each period t only to the politician in office, and the individual stock of education, e_t^i . As before, $q = P(\sigma_t = H)$ is the probability that the economy is at time t in the high state — where the public project is implementable.³⁴ I assume that, at time 0, $\sigma_0 = H$ and that each individual is endowed with an initial stock e_0^i , drawn randomly from $\ln e_0^i \sim \mathcal{N}(\mu_0, \Delta_0^2)$, that evolves endogenously according to the following law of motion the governs the evolution of the economy:

$$e_{t+1}^i = (1 - \delta)e_t^i + h_t^i. \tag{B1}$$

Citizens and politicians discount time at the rate β and have the following objective

³⁴I further assume that σ_t is independently and identically distributed across periods.

functions:

$$U_0^I = T_0 - BG_0 + \mathbb{E}_0 \left[\sum_{t=1}^{\infty} \beta^t (T_t - BG_t) \varphi_{t-1} \right], \quad (\text{B2})$$

$$U_0^i = \mathbb{E}_0 \left\{ \sum_{t=0}^{\infty} \beta^t \left[(1 - \tau_t) y_t^i - \frac{1}{\phi} (h_t^i)^\phi \right] \right\}, \quad (\text{B3})$$

where the level of income produced by each individual i at time t is given by:

$$y_t^i = G_{t-1} (e_t^i)^\alpha. \quad (\text{B4})$$

In solving the dynamics of the model, I solely focus on the non-trivial equilibrium paths in which the median voter sets $\hat{\varphi}_t = 1$ and there is scope for monitoring. Thereby, I introduce a restriction on the support of the cost of the public project b — specifically, I assume that $b \in [0, \bar{b}(\eta_t^m)]$.³⁵ Note that, since at time $t+1$ the cost b may switch below or above the threshold $\underline{b}(\eta_t)$ and since $\lambda_t^* \leq 1$, politicians cannot possibly commit to $\lambda_t = 1$. Despite their career concerns, this commitment problem impedes politicians to build a reputation and voters to trust any promises claimed before policies have been determined.³⁶ Past terms actions are non relevant for determining voters' strategies. Thereby the dynamic game can be properly solved using the notion of Markov perfect Bayesian equilibrium.

B.2 Co-evolution of political sophistication and corruption

The model unfolds in exactly the same way as I have illustrated in Section 4. In each period t , each citizen i decides the optimal expansion of education, h_t^i , while the median voter, on the basis of whether the public project has been delivered or not, G_t , decides whether to retain the incumbent using the awareness management model introduced in Equation (7). The unique difference with the former set-up is that the continuation value of the incumbent is now made up of a flow of rents that in each period t the incumbent receives for remaining in office. This flow enlarges with time, if the economy embraces

³⁵In the case in which $b > \bar{b}(\eta_t^m)$ in every period t politicians just *hit-and-run* so that the whole economy quickly converges to a steady-state of poverty. Since I am interested in studying how income accumulation moves hand-in-hand with voters' ability of keeping politicians accountable I solely concentrate on the more interesting case and assume $b \in [0, \bar{b}(\eta_t^m)]$.

³⁶The impossibility of building a reputation was first discussed in the pioneering works of Barro (1973) and Ferejohn (1986), and it has become central to political agency models. From that perspective, campaign promises are meaningless because policies are not actually determined until the candidate has already been elected.

an equilibrium path consistent with growth and efficient political monitoring, or shrinks if the economy gets trapped in a path with low growth and a systematic rent-seeking behavior of its representatives. Central to this is therefore the evolution of education and, as we will see, its co-evolution with political accountability.

The difference equation that governs the economy when incumbent's and voters' incentives are perfectly aligned (i.e., if $b < \underline{b}(\eta_t)$) is given by:

$$e_{t+1}^i = \frac{1 - \delta}{1 - \Omega} e_t^i, \quad (\text{B5})$$

which I obtain from substituting the solution of (16) into (B1) and setting $\hat{\lambda}_t = 1$. Since $\underline{b}(\eta_t)$ monotonically increases with η_t , a rich economy trajectory solely depends on the capacity of it in growing at a faster rate than its depreciation. Furthermore, as $\Delta e_{t+1}^i = e_{t+1}^i - e_t^i \geq 0$ if and only if $\delta \leq \Omega$, a rich economy will steadily grow if $\delta \leq \Omega$, while it will embark on a decreasing pathway if $\delta > \Omega$. The evolution of these economies are therefore in line with the model described in Galor and Zeira (1993) where political deception is not a mechanism that jeopardizes the individual human capital accumulation.³⁷

An economy with a low average level of education, η_t , has a low threshold $\underline{b}(\eta_t)$ and is likely to cope with potentially dissonant politicians in office. It is, in fact, more likely to embark on a trajectory that crucially depends on the efficiency of the political monitoring. For these economies political sophistication is an essential tool. Its evolution is defined by the following system of equations:

$$e_{t+1}^i(e_t^i, \lambda_t^*) = \frac{1 - \delta}{1 - \Omega(1 - (1 - \lambda_t^*)\eta_t^i)} e_t^i, \quad (\text{B6})$$

$$\lambda_t^*(\eta_t^m, q) = 1 - \frac{1 - q}{q} \frac{1}{\eta_t^m}, \quad (\text{B7})$$

where Equation (B6) is obtained by plugging the solution of (16) into (B1) and setting $\hat{\lambda}_t = \lambda_t^*$, while Equation (B7) is the sophisticated electoral accountability constraint that, in each period t , the median voter uses to punish deceptive politicians in office.

The intersection of the two loci yields the trajectory of education observed at time t

³⁷Furthermore, note that the such a dynamics necessarily implies a non-degenerate distribution of income in the steady-state.

for each citizen i when $b > \underline{b}(\eta_t)$:

$$e_{t+1}^i(e_t^i, e_t^m) = \frac{1 - \delta}{1 - \Omega\left(1 - \frac{\eta_t^i}{\eta_t^m} \frac{1-q}{q}\right)} e_t^i. \quad (\text{B8})$$

It is immediate to see from Equation (B8) that the level of political sophistication of the median voter is central to trace the evolution of the economy as whole, pushing up the individual accumulation process and acting as a guarantee for a well-functioning democracy—punishing politicians that are less congruent than λ_t^* . More precisely, the rate of change of education critically depends on the individual *relative* level of political sophistication, $\frac{\eta_t^i}{\eta_t^m}$. Citizens with a rate of political sophistication above the median penalize more the accumulation process in the fear of dissonant politicians in office. Those with a rate of political sophistication below the median expand the stock of education at a higher pace—as they are not fully aware of dissonant rulers.

Hence, each individual trajectory in (B8) will eventually converge to a common steady-state, which has the following implicit functional form:

$$e_\infty = \left(1 - \frac{\delta}{\Omega}\right) \left(\frac{q}{1-q}\right) e_\infty^m. \quad (\text{B9})$$

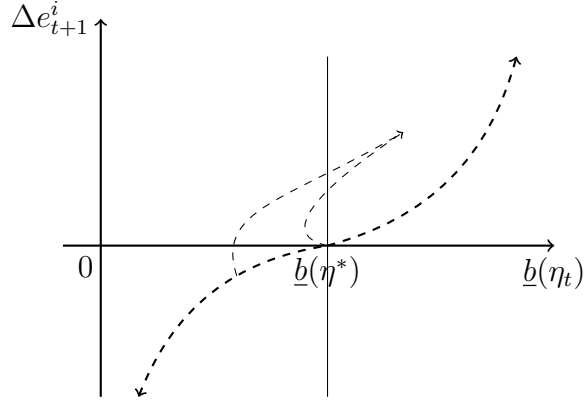
Persistence reflects on the steady state equilibrium. Since a well-educated majority of voters lead to better politicians that in turn invest in productive public goods, and since the accumulation of education is persistent, multiple steady states may arise. The theory indeed predicts a continuum of steady states featuring societies with different level of political sophistication and stock of education, represented by politicians with a different degree of congruence. Since the two are complementary, societies initially more educated (i.e., those with higher e_0^m), in equilibrium, have consonant politicians as well as a larger stock of education accumulated.

Using the intermediate value theorem it can be shown that there exists a unique value of η_t , η^* , and a unique correspondent value of $\underline{b}(\eta_t)$, $\underline{b}(\eta^*)$, such that those economies with $\underline{b}(\eta_t) \geq \underline{b}(\eta^*)$ embark on a trajectory of stable growth, while those with $\underline{b}(\eta_t) < \underline{b}(\eta^*)$ embark on a complex trajectory that may recover only if the median voter is well educated. I refer to the first type of economies as rich and to the second as poor.

Rich economies embark on a trajectory which evolves as follows:

$$\Delta e_{t+1}^i = e_{t+1}^i - e_t^i = \frac{\Omega - \delta}{1 - \Omega} e_t^i, \quad (\text{B10})$$

Figure B1: The evolution of education when $\delta \leq \Omega$.



where the expression of e_{t+1}^i is given by Equation (B5) and $\Omega < 1$. It is immediate to see that the evolution of rich economies departs from the unstable steady-state $e_\infty^i = 0$, where $\Delta e_{t+1}^i = 0$, if and only if $\delta \leq \Omega$, while it converges toward the stable steady-state $e_\infty^i = 0$, where $\Delta e_{t+1}^i = 0$, if and only if $\delta > \Omega$. The first pathway is drawn in Figure B1, when $b(\eta_t) \geq b(\eta^*)$.

Poor economies embark on a trajectory which evolves as follows:

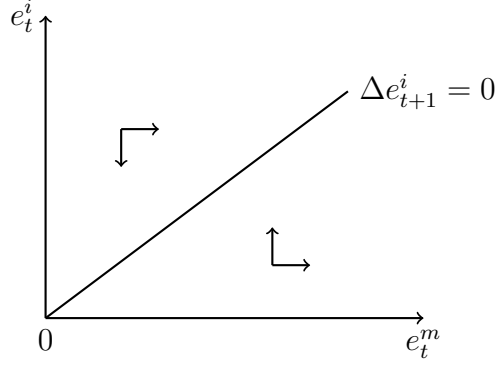
$$\Delta e_{t+1}^i = e_{t+1}^i - e_t^i = \left[\frac{\Omega \left(1 - \frac{\eta_t^i}{\eta_t^m} \frac{1-q}{q} \right) - \delta}{1 - \Omega \left(1 - \frac{\eta_t^i}{\eta_t^m} \frac{1-q}{q} \right)} \right] e_t^i, \quad (\text{B11})$$

where the expression of e_{t+1}^i is given by Equation (B8). Now, the evolution of each individual trajectory crucially depends on the stock of education owned by the median voter which can potentially block any attempt of politicians to manipulate the beliefs of the electorate. The trajectory of the median is given as follows:

$$\Delta e_{t+1}^m = e_{t+1}^m - e_t^m = \left[\frac{\Omega - \delta - \Omega \left(\frac{1-q}{q} \right)}{1 - \Omega - \Omega \left(\frac{1-q}{q} \right)} \right] e_t^m. \quad (\text{B12})$$

Note that in Equation (B11) the rate of individual educational expansion in the transition from t to $t+1$ critically depends on the individual *relative* level of political sophistication, $\frac{\eta_t^i}{\eta_t^m}$. Citizens with a rate of political sophistication above the median penalize more the accumulation process in the fear of dissonant politicians in office. Those with a rate of political sophistication below the median expand the stock of education at a higher pace—as they are not fully aware of dissonant rulers. The diagram

Figure B2: Phase diagram of the co-evolution of e_t^i and e_t^m for $\delta \leq \Omega$.



of phase of the co-evolution of η_t^i and η_t^m is illustrated in Figure B2 for $\delta \leq \Omega$.

It is therefore intuitive that there exists a period $t^* \in (0, \infty)$ starting from which each trajectory will eventually catch-up the rest of them. In each period $\tilde{t} \in [t^*, \infty)$, the distribution of education turns to a degenerate one in which $e_{\tilde{t}}^i \equiv e_{\tilde{t}}^m$. The dynamics of the system embarks on a degenerate ergodic process described by the following linear law of motion:

$$e_{\tilde{t}} = \left[\frac{1 - \delta}{1 - \Omega \left(1 - \frac{1-q}{q}\right)} \right]^{\tilde{t}} e_0^m \quad \forall \tilde{t} \in [t^*, \infty). \quad (\text{B13})$$

Note that as long as $\Delta e_{t+1}^m \geq 0$, all the citizens, first the less well educated and then also the well educated, increase their stock of education in the transition from t to $t+1$. The dynamical system $e_{t+1}^i(e_t^i; e_t^m)$ thereby reduces to a one-dimensional recursion as expressed in (B13).

There is a unique steady-state at $e_\infty^m = 0$. To study the stability of the steady-state, let us denote $D = \frac{1-\delta}{1-\Omega \left(1 - \frac{1-q}{q}\right)}$. I can distinguish between two cases:

- If $D < 1$, or equivalently if $\delta > \tilde{\delta} := \Omega \left[1 - \left(\frac{1-q}{q}\right)\right]$, then $e_\infty^m = 0$ is stable and the economy will converge to it.
- If $D \geq 1$, or equivalently if $\delta \leq \tilde{\delta} := \Omega \left[1 - \left(\frac{1-q}{q}\right)\right]$, then $e_\infty^m = 0$ is unstable and the economy will diverge toward the following trajectory:

$$e_\infty = \lim_{\tilde{t} \rightarrow \infty} \left[\frac{1 - \delta}{1 - \Omega \left(1 - \frac{1-q}{q}\right)} \right]^{\tilde{t}} e_0^m. \quad (\text{B14})$$

Note that the level of education of the median citizen determines the rate of velocity

of the trajectory of the economy.

- If $D = 1$ the equilibrium is not unique and it is entirely given by the initial condition e_0^m .

I summarize these results in the following proposition:

Proposition 3 (Steady State Equilibrium) *Let $\Omega := 2\beta q(1 - \tau) < 1$ and $\tilde{\delta} := \Omega[1 - \frac{1-q}{q}]$. Then the following statements hold.*

(i) *If $\underline{b}(\eta_0) \geq \underline{b}(\eta^*)$, then we have:*

- (a) *If $\delta > \Omega$, the economy converges to a zero level of education, no matter the initial condition. The equilibrium is unique.*
- (b) *If $\delta \leq \Omega$, the economy gets richer over time and appointed politicians are fully congruent, no matter the initial level of political sophistication, η_0^m . The equilibrium is unique.*

(ii) *If $\underline{b}(\eta_0) < \underline{b}(\eta^*)$, then we have:*

- (a) *If $\delta > \tilde{\delta}$, the economy converges to a zero level of education, no matter the initial condition. The equilibrium is unique.*
- (b) *If $\delta \leq \tilde{\delta}$, then multiple stable steady states arise, with initially more sophisticated societies at the median level characterized by congruent politicians and high levels of income.*

C Additional Tables and Figures

Table C1: Correlation between confidence in the government, education, quality of political institutions, and access to information

	Dependent variable is: “ <i>confid. in the gov.</i> ”		
	(1)	(2)	(3)
<i>Primary</i>	-0.020 (0.021)	-0.017 (0.021)	-0.020 (0.021)
<i>Tertiary</i>	0.096*** (0.020)	0.096*** (0.020)	0.096*** (0.020)
<i>Primary</i> $\times$ $\overline{OECD}$	0.069*** (0.024)	0.074*** (0.024)	0.077*** (0.024)
<i>Tertiary</i> $\times$ $\overline{OECD}$	-0.147*** (0.024)	-0.152*** (0.024)	-0.148*** (0.024)
$\overline{OECD}$	-0.343*** (0.059)	-0.339*** (0.059)	-0.333*** (0.059)
Daily newspaper		0.032*** (0.010)	
News broadcasts on radio or TV			0.104*** (0.016)
Constant	2.165*** (0.050)	2.135*** (0.051)	2.062*** (0.053)
Observations	38,816	38,816	38,757
R^2	0.199	0.199	0.200

Notes: Robust standard errors are reported in parentheses. All specifications include individual controls (age, gender, family status, income status, having a son, and size of the city where respondent lives) as well as country and religion dummies. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table C2: Contingency table.

	$\tilde{\sigma} = L$	$\tilde{\sigma} = H$	
$\sigma = L$	$P^i(\sigma = L, \tilde{\sigma} = L) =$ $P^i(\tilde{\sigma} = L \mid \sigma = L) \times P(\sigma = L) =$ $1 \times (1 - q) = 1 - q$	$P^i(\sigma = L, \tilde{\sigma} = H) =$ $P^i(\tilde{\sigma} = H \mid \sigma = L) \times P(\sigma = L) =$ $0 \times (1 - q) = 0$	$P(\sigma = L)$
$\sigma = H$	$P^i(\sigma = H, \tilde{\sigma} = L) =$ $P^i(\tilde{\sigma} = L \mid \sigma = H) \times P(\sigma = H) =$ $(1 - \lambda)\eta^i q$ $P(\tilde{\sigma} = L)$	$P^i(\sigma = H, \tilde{\sigma} = H) =$ $P^i(\tilde{\sigma} = H \mid \sigma = H) \times P(\sigma = H) =$ $(1 - (1 - \lambda)\eta^i)q$ $P(\tilde{\sigma} = H)$	$P(\sigma = H)$

D The awareness management model and the Spence-Mirrlees condition

Looking closer at Equation (7) one realizes that it satisfies the Spence-Mirrlees condition:

$$\frac{\partial^2 p^i(\lambda, \eta^i, q)}{\partial \lambda \partial \eta^i} \geq 0. \quad (\text{D1})$$

This sorting condition states that higher types, η^i , are more responsive to a given increase in λ . So, if voter i , with η^i , thinks the congruence rate has increased he will readjust more quickly his guess over $p^i(\lambda, \eta^i, q)$ than voter j with $\eta^j < \eta^i$. This feature of Equation (7) captures two basic ideas unfolded by political psychologists: (i) Chaiken (1980) and Petty and Cacioppo (1979) argued that more politically sophisticated voters are more easily persuaded by reasoned argument as well as less easily by mere symbolic display; (ii) Miller and Miller (1976) and Wyckoff (1980) showed that they are more attentive to policy issues (captured by the message $\tilde{\sigma}$) and less to the candidates' personas in deciding how to vote.

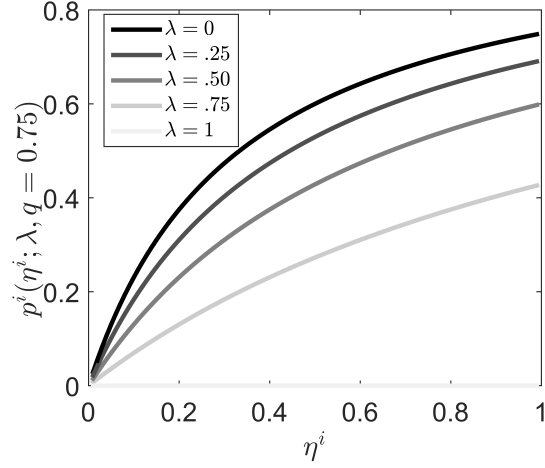
As I have illustrated in the paper, this condition turns the incumbent to assign a higher weight to the more sophisticated citizens in setting λ . Here, I discuss the implication of the Spence-Mirrlees condition using Figure D1, where I draw a family of curves that link η^i , in the x-axis, to $p^i(\eta^i; \lambda, q)$, in the y-axis, for a sequence of values of λ and holding fixed q at $\frac{3}{4}$. (Darker) curves that lie above depict a less credible incumbent while (lighter) curves that lie at the bottom picture a more credible incumbent at the voters' eye. Hence, the rate of credibility naturally increases with λ or, put in an equivalent way, the probability that voter i believes the incumbent cheats decreases with λ :

$$\frac{\partial p^i(\lambda, \eta^i, q)}{\partial \lambda} \leq 0. \quad (\text{D2})$$

Graphically, this amounts to a downward shift of $p^i(\lambda; \eta^i > 0, q)$ from darker to lighter curves in Figure D1. Note that for fully naïve voters (with $\eta^i = 0$), (D2) holds with equality, as this voters hold not responsive beliefs.

Secondly, holding λ fixed and letting η^i to vary along each curve, it is evident that more sophisticated voters tend to believe less at the incumbent's message, as they are

Figure D1: Voter i 's estimated likelihood that the incumbent cheats, $p^i(\lambda, \eta^i, q)$, as a function of political sophistication η^i for different values of λ .



more aware of the perverse incentive he might have when the state is high in setting λ :

$$\frac{\partial p^i(\lambda, \eta^i, q)}{\partial \eta^i} \geq 0. \quad (\text{D3})$$

Note that when the incumbent is believed to be fully congruent (the lightest line in Figure D1), (D3) holds with equality, as even the most politically expert voters assess the incumbent's behavior as honest. Reversely, (D3) also means that political naïvete is more associated with credulousness, as a decrease in η^i reduces $p^i(\lambda, \eta^i, q)$. Taken to the extreme, (D2) and (D3) imply that a (babbling) sub-game equilibrium, with a non-informative message $\tilde{\sigma}$, arises only if $\lambda = 0$ and $\eta^i = 1$.³⁸

³⁸A babbling equilibrium results when the message $\tilde{\sigma}$ does not convey any information on σ ; in other words, when the posterior $p^i(\lambda, \eta^i, q)$ equalizes the prior q .

E Political beliefs formation

This section analyzes different posterior distributions resulting from different *types* of societies, that is societies characterized by a different distribution of political sophistication $F(\eta^i)$. This analysis complements the description of the individual cognitive process outlined in Section 3.2.

A critical aspect of the model is that a different level of political sophistication translates into a different belief about the incumbent, i.e. $p^i(\cdot)$, *even if* the voters use the same awareness-management model, observe the same congruence rate λ , and have same prior q . This is because political sophistication gives voters cognitive abilities to connect logically λ and σ . Put in another way, political sophistication gives expertise on whether to distinguish external factors (i.e., σ) from internal factors (i.e., λ) when voters observe a failure in the provision of the public good.

It thus follows that an initial different distribution of citizens in term of political sophistication, $F(\eta^i)$, features a different electoral outcome despite the high state of the world is equally likely to occur (q) and the incumbent is equally likely to lie (λ). In this section I offer four simulation exercises that differ from a different draw from $F(\eta^i)$. Specifically, Figure E1 considers a society where politically naïve citizens are of the same numerosity than sophisticated citizens (i.e., a uniform distribution with $\eta \sim \text{Beta}(1, 1)$). Figure E2 considers a society where education distributes symmetrically; yet fully naïve and sophisticated citizens are a few and lie in the tails (i.e., a bell shaped distribution with $\eta \sim \text{Beta}(2, 2)$). Figure E3 illustrates the distribution of sophistication in a society with more naïve than sophisticated citizens (i.e., a positive skewed distribution with $\eta \sim \text{Beta}(2, 4)$), while Figure E4 considers a very sophisticated society (i.e., a negative skewed distribution with $\eta \sim \text{Beta}(4, 2)$).

Each Figure is composed by two panels. The leftmost panel shows the probability distribution function of η^i . The rightmost uses the awareness-management model (Equation 7), fixed values of $q = 0.75$, to compute the probability distribution function of $p^i(\hat{\lambda}, \eta^i; q = 0.75)$.

The simulation shows that people are more in favor (ex-post) of replacing a dissonant incumbent, after a small rate λ is observed (the red pdf line). Even more importantly, it indicates that more sophisticated societies are clearly the most responsive to this. In the constituency depicted in Figure E4, for instance, a substantial majority in favor of the belief ‘the incumbent is a cheater’ formed once a small λ is observed.

Figure E1: Bayesian inference in a society of $n = 10^5$ citizens where education distributes uniformly.

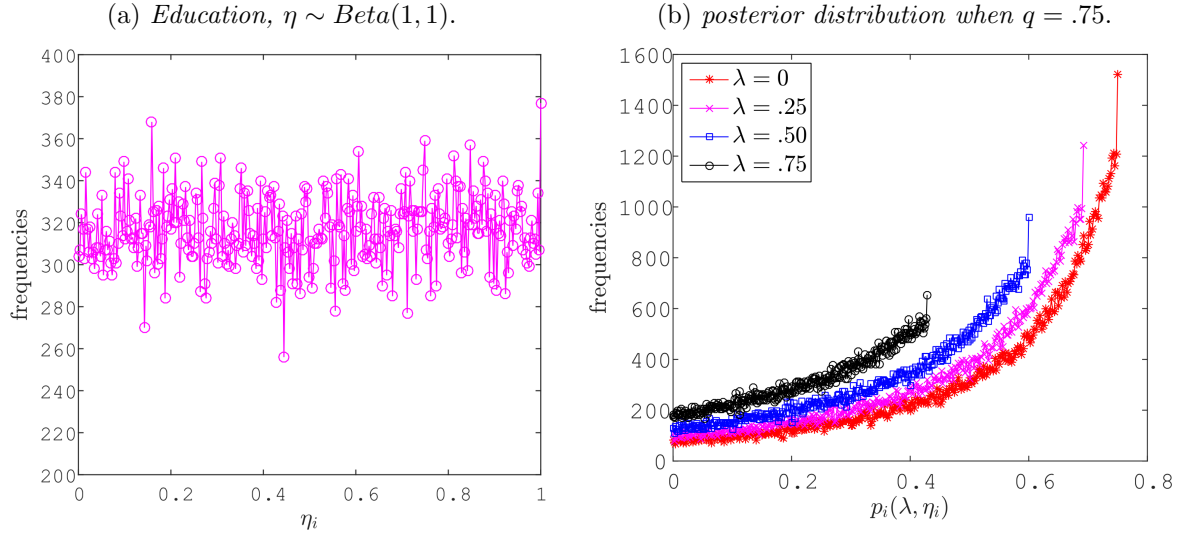


Figure E2: Bayesian inference in a society of $n = 10^5$ citizens where education distributes symmetrically.

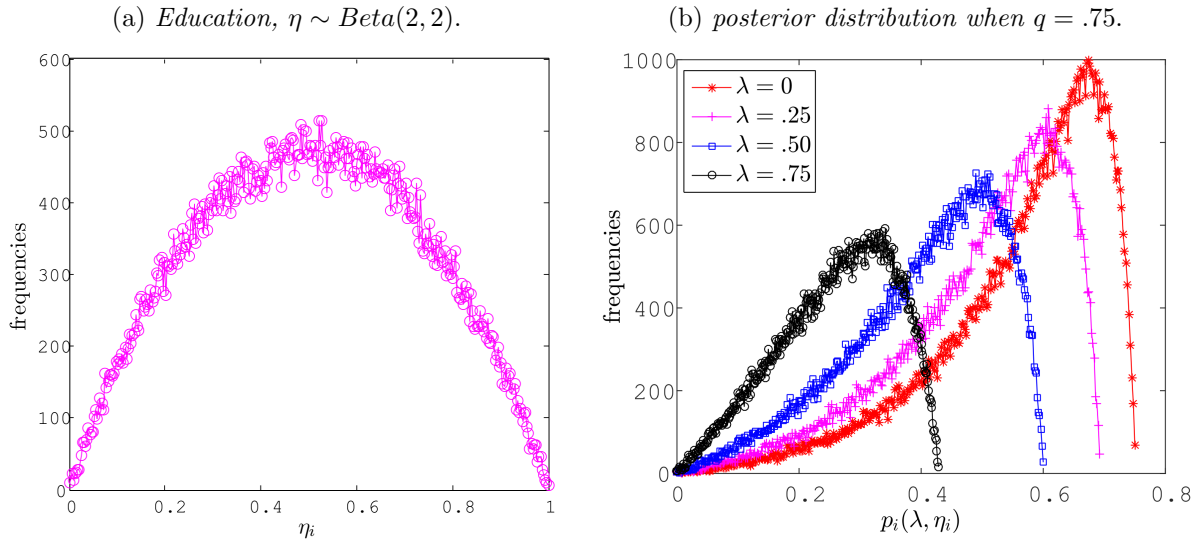


Figure E3: Bayesian inference in a society of $n = 10^5$ citizens where the distribution of education is positive skewed (right-tailed).

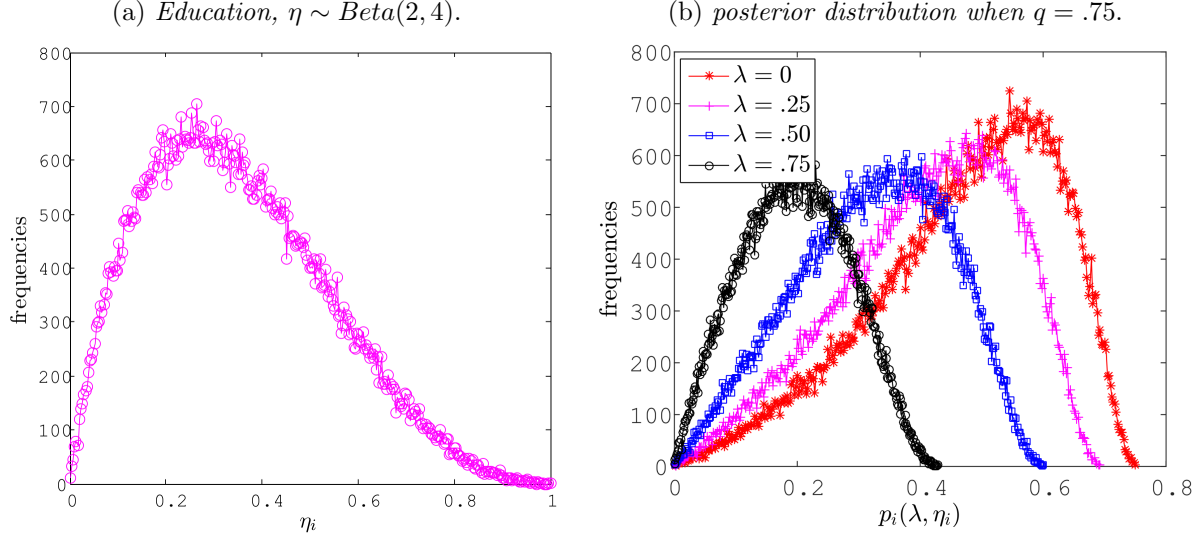


Figure E4: Bayesian inference in a society of $n = 10^5$ citizens where the distribution of education is negative skewed (left-tailed).

