Fiscal Policy, Government Polarization, and the Economic Literacy of Voters

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1 November 2016

Fiscal Policy, Government Polarization, and the Economic Literacy of Voters[*]

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[This version: November 2016]

Abstract

We model a two-parties electoral game in an environment where voters are imperfectly informed on the administrative ability of each party. In equilibrium, parties try to manipulate voters' beliefs and implement fiscal policies that are looser than the social optimum. The size of this deviation from optimality increases with the incentive of parties to manipulate, the voters' information disadvantage, and the interaction between these two elements. We test our theoretical predictions on a sample of 23 OECD countries over the period 1999–2008. We measure the *incentive* to manipulate voters' beliefs through the ideological cohesion of the cabinet (i.e. government polarization), and the *scope* to manipulate such beliefs through the level of voters' economic literacy. We find that polarized governments tend to worsen fiscal balances, and this is more likely in countries where the voters' economic literacy is low. However, such tendency vanishes as literacy increases, suggesting that polarization leads to biased fiscal policies only when there is enough room for manipulation. Our results remain stable after controlling for potentially confounding differences across countries and over time – such as individuals' education attainments, electoral and institutional systems, voter turnout –, several types of falsification tests, time dynamics and unobserved heterogeneity.

Keywords: budget balance; government polarization; electoral game; economic literacy.

JEL Codes: D72; E62; H62.

I. Introduction

Advanced democracies usually exhibit higher public deficits and debt accumulations than they would do with a social planner. The explanation generally advanced by economists is that policymakers are moved by political objectives in addition – or even in substitution – to the economic ones.[1] In this work, we contribute to this debate by investigating the behavior of politicians in seeking consensus and how the contingencies associated with this behavior affect the fiscal policy stance.

The search for consensus has always been central in the political economy literature, and previous works have shown that such a search leads to an incentive to excessive spending. While early contributions assume that voters fail to understand the intertemporal budget constraint and thus politicians exploit this voters' irrationality to boost their consensus through profligate policies (Buchanan and Wagner 1977), more recent contributions assume that voters are fully rational. Notably, Rogoff (1990) assumes voters as rational but imperfectly informed on the administrative abilities of politicians. Thus, governments implement excessively loose fiscal policies before the election to signal high abilities to uninformed voters or manipulate the voters' beliefs in those high abilities.

We follow the 'rational voter' literature and stress the importance of the sources of imperfect information. The main novelty of this work lies in what makes a voter unable to assess the abilities of politicians: her/his poor understanding of economic affairs. We claim that voters with high levels of economic competence are able to access and properly process information on the ability of politicians. Thus, these voters may be assumed as perfectly informed. Conversely, voters with low levels of economic competence are unable to get and process the available information on the quality of politicians and, therefore, such voters are imperfectly informed. Hence, for a given manipulation *incentive*, the incidence of economically incompetent voters represents the *scope* of manipulation.

In principle, the ability to assess the skills of politicians does not only rely on the economic competence of voters but also on the amount and the quality of information available to them. Yet, we prefer to focus on the economic competence for two reasons. First, since the burst of the sub-prime crisis in 2008, many economists have been becoming skeptical on the benefits of sheer

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[1] Alesina and Tabellini (1990a) argue that the government in office creates excessive debt to limit the policy discretion of the next government. Weingast, Shepsle, and Johnsen (1981) and Battaglini and Coate (2008) explain that the excessive spending comes from a common pool problem. This arises when expenditure items benefit single constituencies but are financed by all voters. Finally, Cukierman and Meltzer (1989) suggest that governments are pressed to overspend by current generations because stabilization policies will stand on the shoulders of future generations.

information for rational judgement. Cognitive skills and specific knowledge appear to be at least as important as free access to unbiased and detailed information (Lusardi and Mitchell 2014). Second, the role of information quality and availability has already been investigated in other works, which are complementary to ours (e.g. Alt and Lassen 2006; Shi and Svensson 2006). In addition, these previous studies did not use reliable data about economic competences because such data have only become available in recent years (Jappelli 2010).[2]

To cast the empirical evidence within a tailored theoretical framework, we build a model where on the eve of an election two parties compete for government and announce the fiscal policy they would implement after a successful electoral outcome. The two parties differ for their administrative ability but economically incompetent voters are unable to assess this difference. In this setting, we show that in equilibrium the two parties announce and implement fiscal policies that are looser than the socially optimal ones. The size of this deviation from optimality increases with the incentive to manipulate voters' beliefs, the share of illiterate voters, and the interaction between these two elements.

Our empirical analysis is based on a sample of 23 OECD countries that are observed over the 1999-2008 period. We measure the *incentive* to manipulate voters' beliefs through a variable that captures whether the government is polarized, that is whether cabinet members are ideologically cohesive.[3] The rationale behind this choice is the following. In a polarized political environment, parties competing for government have very different preferences regarding both the size of the public sector and the nature of public goods to be produced (Alesina and Tabellini 1990a). Hence, parties have strong incentives to win the election because the loser party is bound to bear the implementation of policies that are very distant from its own ideal. Then, parties compete fiercely and announce quite different policies.[4] Conversely, in a non-polarized environment, political parties have similar preferences in terms of policies to be implemented and so the incentive to win the election is lower.[5] In the contributions close to ours (Alt and Lassen 2006; Shi and Svensson 2006), the incentive to win the election is ascribed to the ability of parties to extract rents once in office. Accordingly, this incentive is captured with indexes of perceived corruption. However, our focus on

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[2] Shi and Svensson (2006) explicitly acknowledge the role of cognitive skills in processing the available information but they do not perform any empirical test, because of the lack of data.

[3] It is worth noting that ideological polarization does not necessarily mean the presence of a single party in the cabinet, as in winner-take-all electoral systems (e.g. in the United States or the United Kingdom). Indeed, a polarized government can be composed of many political parties with the same political values and ideology which form a coalition to win the election (e.g. in Germany and in Italy left-wing and right-wing parties usually form left-wing and right-wing coalitions).

[4] Borrowing the idea of "monitoring" from the corporate governance literature (Shleifer and Vishny 1997), it is worth noting that – after the election – strongly cohesive governments have sufficient political power to avoid the monitoring of the other parties not in office, and thus put effectively forward the policies they announced before the elections.

[5] After the election, the loser party may in fact be involved by the government in the implementation of shared policies.

advanced economies has led us to discard rent extraction as the key driver behind political competition. Indeed, in advanced countries, civic attitudes and law enforcement are generally strong, so that there is comparatively less room for rent extraction than in other (developing and/or underdeveloped) countries. As to the *scope* to manipulate voters' beliefs, we proxy the economic competence of voters with their level of economic literacy. In this respect, a valuable feature of our data is that economic literacy is highly variable across-countries and over time. This adds a further reason to capture the key informational asymmetry between voters and parties through the voters' ability of processing information instead of the mere diffusion of information, which exhibits very low variability across advanced economies.

The picture arising from the empirical analysis is consistent with our priors. We find that higher polarization is associated to worse fiscal balances, and this association is stronger in countries (and years) where the level of voters' economic literacy is lower. Further, the influence of government polarization on the balance becomes negligible as literacy increases, suggesting that polarization leads to biased fiscal policies only when there is enough room for manipulation. Our results remain stable after controlling for potentially confounding differences across countries and over time (such as individuals' education attainments, electoral and institutional systems, voter turnout), several types of falsification tests, time dynamics and unobserved heterogeneity.

This work contributes to two main research streams. First, it enriches – and derives the main insights from – the 'rational voter' literature opened by Rogoff and Sibert (1988) and Rogoff (1990). These seminal contributions argue that governments distort fiscal policies to signal high administrative skills to uninformed voters. Close to the spirit of our work, Alt and Lassen (2006) claim that signaling is only relevant in countries where the budget formation is not transparent. Building on this intuition, the authors develop a reliable method for measuring budget transparency and show that fiscal discipline tends to be looser in less transparent countries. In the same vein, Persson and Tabellini (2003) and Brender and Drazen (2005) find that political effects on public budgets would also exist in developed economies and "new democracies". Finally, Shi and Svensson (2006) find that fiscal discipline depends on the share of informed voters on a sample of 85 (developed and developing) countries. However – differently from our work – the authors proxy the share of informed voters with two indices of information diffusion (i.e. access to media, as measured by radios per capita and the country's freedom of broadcasting), and not with a measure of voters' ability to process information.

Second, we extend the literature on the effects of economic and financial literacy to a new setting. To the best of our knowledge, this literature – surveyed by Lusardi and Mitchell (2014) – has exclusively focused on the impact of economic literacy on a set of microeconomic decisions.

For instance, a recent contribution by Jappelli and Padula (2013) explores the link between individual financial competence and saving behavior, while other works focus on the role of financial competence for individual wealth accumulation, portfolio choice and retirement decisions (e.g., Lusardi and Mitchel 2007; Behrman et al. 2010; Jappelli and Padula 2015). In this work, our contention is that economic competences are relevant not only for the individual behavior but also for collective actions and decisions. As to these latter, we investigate the role of such competences for the government's implementation of fiscal policies.

The paper proceeds as follow. Section II describes the model and derives the theoretical predictions. Section III describes the data, discusses the empirical strategy, and tests the predictions of the model. Section IV and Section V show a set of robustness checks and provide additional evidence. Finally, Section VI concludes.

II. The Model

II.A. Environment

The model studies the decisions of two political parties (A and B) and of a unit mass of voters in the eve of an electoral competition. The decision of each party concerns the design of a policy platform to propose to voters. This platform consists in announcing taxes that will be levied and public goods that will be provided in case of electoral win. The decision of each voter consists in choosing the party to vote for.

The events following the election are completely determined by these decisions. Indeed, after the election, the party that obtains the majority of votes runs the government and implements the announced policy platform. This amounts to assume that the reputational cost of deviating from pre-election announcements is prohibitively large.[6]

The welfare of voter i under the rule of party j is given by the sum of two terms. The first is the pure economic welfare, while the second represents her/his political preferences:

$$U(c_j, g_j, s_j; \theta_j, \varepsilon_i, z) = V(c_j, g_j, s_j) + \theta_j(\varepsilon_i + z) \qquad j = A, B \qquad (1)$$

$$V(c_j, g_j, s_j) \equiv \frac{1+\gamma}{\gamma} \cdot min(c_j, \gamma g_j) - \frac{1}{2}[T - s_j]^2 \qquad (2)$$

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[6] On this point, see Aragonès, Postlewaite, and Palfrey (2007). One may claim that the cost of deviating from an electoral announcement is large in the immediate aftermath of an election but it is likely to be small after some periods. In fact, this would apply if the timing of the model was only referred to the general elections. However, our model aims at capturing elements of political behavior that occur at higher frequencies than those of the general electoral cycle. For instance, parties are influenced by the opinion polls or by the outcome of local elections that take place between two general election rounds. For a detailed discussion on this point see also Bisin, Lizzeri, and Yariv (2015).

Economic welfare V is common to all individuals. The first two components of V (c_j and g_j) convey the utility from consumption, while the third component conveys the concern for the sustainability of public finances. As to the first two components, c_j and g_j represent the individual consumption of private and public goods respectively. These goods are perfect complements with parameter γ controlling for proportions. As to the third component, s_j represents the public budget surplus while T is a parameter that represents the desirable surplus from the perspective of financial markets and/or rating agencies. Thus, voters dislike discrepancies between the current and the desired surplus, because they are aware that unsustainable public finances will entail a reduction in future consumption.[7]

Turning to the political preferences, θ_j is a dummy that equals one if $j = A$, and zero otherwise. The sum $\varepsilon_i + z$ measures the preference of the individual i for party A. The term ε_i is non-stochastic and subjective, and may be interpreted as a personal trait that captures how close - or how far - are the ideas of the individual i to those of party A. Conversely, z captures elements of preference that are common to all individuals and whose electoral impact is *ex-ante* uncertain (the appeal of candidates, for instance). We assume that the cross-individual distribution of $\varepsilon_{(.)}$ is zero-mean and symmetric. Further, we assume that z is extracted from a density distribution that is uniform over the support $[-\bar{z}/2, \bar{z}/2]$.

Each voter is endowed with resources y, which are used for private consumption after the government has levied lump sum taxes:

$$c_j = y - t_j \tag{3}$$

In turn, taxes are used to provide public goods and finance the surplus. Public goods are produced through the following linear technology:

$$g_j = t_j - s_j + \eta_j \tag{4}$$

The difference $t_j - s_j$ represents the resources that are used as inputs in the provision of public goods, while η_j represents the ability of the government in generating output from given inputs. We assume that parties are endowed with different abilities in the sense that, before the election, Nature extracts the ability of each party from two identical but independent distributions. Crucially, we also assume that not all voters are able to observe the extracted abilities. A fraction $1 - \sigma$ of

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[7] The quadratic form also implies a loss of welfare when the current surplus is larger than the desired surplus. However, this occurrence is ruled out in equilibrium.

voters is composed of individuals with a poor understanding of economic affairs. These individuals are thus unable to assess the administrative competence of parties.

We use P^j to represent the probability of party j to get the majority of votes and assume that the objective of each party is:

$$V\left(c_j, g_j, s_j\right) + \rho P^j \qquad 0 \leq \rho < \infty \qquad j = A, B \qquad (5)$$

This amounts to assume that party j is concerned with both the aggregate social welfare and the probability of being in office. The relative weight associated to the two objectives depends on ρ. If $\rho = 0$, the party is only concerned with social welfare. As ρ increases, the concern for winning the election gains momentum over social welfare.

The sequence of actions is the following. First, Nature extracts the abilities of parties and privately reveals to each party its own ability. Second, parties simultaneously announce their policy platforms, i.e. taxes and public goods. Third, Nature extracts z. Finally, voters observe the announced platforms and cast their vote. The party that obtains the majority of votes is entitled to run the government and implement the announced policy.

II.B. Voters and Parties

Each voter casts her/his vote to the party that attains the better combination of economic welfare and political appeal. Thus, focusing on an individual i who observes the abilities of parties and exhibits $\varepsilon_i = 0$ (median voter), she/he votes for the party j if:

$$V\left(c_j, g_j, s_j\right) - V\left(c_{j\prime}, g_{j\prime}, s_{j\prime}\right) \geq \left(\theta_{j\prime} - \theta_j\right)z \quad j, j' = A, B \quad (6)$$

Since abilities are known and the party that wins the election will not deviate from pre-election announcements, the individual i directly observes s_j ($= t_j - g_j + \eta_j$).

Conversely, a median voter who does not observe the abilities of parties votes for the party j if:

$$V\left(c_j, g_j, E\left(s_j | t_j, g_j\right)\right) - V\left(c_{j\prime}, g_{j\prime}, E\left(s_{j\prime} | t_{j\prime}, g_{j\prime}\right)\right) \geq \left(\theta_{j\prime} - \theta_j\right)z \quad (7)$$

Since abilities are unknown, the individual does not observe s_j but she/he needs to form an expectation on it. This expectation is conditional on the announced policy as the policy is decided after the party's own ability has been revealed and, henceforth, the party may convey information on its policy.

Due to the symmetric distribution of ε_0, the probability for party j to get the majority of votes coincides with the probability that the median voter votes for j. On the basis of equations (6) and (7), we have:

$$P^j(c_j, g_j, s_j, c_{j'}, g_{j'}, s_{j'}) = \frac{1}{2} + \frac{\sigma}{\bar{z}}\left[V(c_j, g_j, s_j) - V(c_{j'}, g_{j'}, s_{j'})\right]$$

$$+ \frac{1-\sigma}{\bar{z}}\left[V\left(c_j, g_j + E(s_j|t_j, g_j)\right) - V\left(c_{j'}, g_{j'}, E(s_{j'}|t_{j'}, g_{j'})\right)\right] \qquad (8)$$

The expression in the first square brackets refers to the probability that an informed median voter votes for j, while the expression in the second square brackets refers to the same probability for an uninformed median voter.

As to the behavior of parties, party j observes its own ability η_j and announces a policy platform that solves the problem:

$$\langle t_j, g_j \rangle = argmax \, V(c_j, g_j, s_j) + \rho E\left[P^j(c_j, g_j, s_j, c_{j'}, g_{j'}, s_{j'})\right] \qquad (9)$$

$$s.t. \; eq.\,(3), (4)$$

The party maximizes the weighted sum of social welfare and the expected probability of winning the election. The probability is expected as it depends on the unknown opponent's policy and ability.

II.C. Equilibrium

In equilibrium, voters have rational expectations, and party j announces a policy $\{t(\eta_j), g(\eta_j)\}$ that is the best response to the one announced by party j'. With fully informed voters (i.e. $\sigma = 0$) the unique (Nash-) equilibrium of the game played by the two parties is represented by the following policy functions:

$$t^{SO}(\eta_j) \equiv \frac{\gamma}{1+\gamma}\left(\frac{y}{\gamma} + T - 1\right) - \frac{\gamma}{1+\gamma}\eta_j \qquad j = A, B \qquad (10)$$

$$g^{SO}(\eta_j) \equiv \frac{1}{1+\gamma}(y - T + 1) + \frac{1}{1+\gamma}\eta_j \qquad j = A, B \qquad (11)$$

It turns out that each party announces and implements the policy that is socially optimal (SO) given its own ability. Indeed, parties behave as if the probability of winning the election was not included in their objective function. This happens because all voters observe their abilities, thus deviating from the social optimum *reduces* the probability to win the election.

By contrast, if some voters are not fully informed, one needs a mechanism that describes how these voters form their expectation on η_j conditional on the announced policy of party j. This means that,

in equilibrium, expectations depend on the announced policy and the policy depends on how expectations are formed.

We tackle the interdependence between policy and expectations by using the method of undetermined coefficients. This amounts to assume a policy function with unknown parameters and derive expectations on the basis of this conjecture. Parameters are pinned down by imposing consistency between the conjecture and optimal behavior.

More in detail, on the basis of (10) and (11), we conjecture that the two policy functions are linear with respect to the ability:

$$t_j = \alpha_t + \beta_t \eta_j \qquad\qquad g_j = \alpha_g + \beta_g \eta_j \qquad\qquad (12)$$

This means that t_j and g_j are both sufficient statistics for η_j, so that the uninformed voter may infer η_j from either. We also assume that a fraction $\mu\ (\leq 1)$ of uninformed voters uses t_j, while the complementary fraction $(1 - \mu)$ uses g_j. This leads to the following expression for the average expected value of η_j:

$$E\big(\eta_j | t_j, g_j\big) = \mu \frac{t_j - \alpha_t}{\beta_t} + (1 - \mu) \frac{g_j - \alpha_g}{\beta_g} \qquad\qquad (13)$$

Equation (13) illustrates the key mechanism of the model. Party j is aware that the uninformed voters use the announced policy to infer η_j. Thus, the party has an incentive to announce a policy that increases the chances of electoral success at the expense of a lower social welfare.

Using the inference rule (13) in problem (9) and imposing consistency between the actual and the conjectured policy, one finds the following equilibrium policy:[8]

$$t(\eta_j) = t^{SO}(\eta_j) - \frac{\gamma}{1 + \gamma} B \qquad (14)$$

$$g(\eta_j) = g^{SO}(\eta_j) + \frac{1}{1 + \gamma} B \qquad (15)$$

$$B \equiv \frac{\rho(1 - \sigma)}{\bar{z} + \sigma\rho} \qquad (16)$$

The policy is presented in terms of deviations from the social optimum. Firstly, notice that μ is irrelevant for the equilibrium, i.e. the equilibrium does not depend on the fraction of voters that use the announced taxation or the announced expenditure to infer the competence of politicians.

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[8] See the Appendix A for technical details.

Secondly and more importantly, notice that the search for consensus, in combination with imperfect information, imposes a deviation from the socially optimal policy – that moves taxes downward and the expenditure upward. This deviation is represented by the non-negative term B. As a result, the fiscal surplus turns out to be smaller than the social optimum level:

$$s_j = s^{SO} - B \qquad\qquad s^{SO} \equiv T - 1 \qquad\qquad (17)$$

II.D. Comparative Statics

To interpret these results notice that, with asymmetric information, the social optimum is not incentive-compatible. If voters believe that parties implement the socially optimal policy, then each party has an incentive to deviate from such socially optimal policy to a policy characterized by lower taxes and higher expenditures. In fact, such a deviation entails a small cost (second order) in terms of social welfare but causes a discrete (first order) increase in the probability of winning the election as the uninformed voter is induced to over-estimate the party's ability.

By the same token, incentive-compatibility requires a mechanism that eliminates the temptation to deviate. In equilibrium, this mechanism is provided by the distortion B. Since voters already expect a distorted policy, gaining consensus through an even looser policy is discouraged by the discrete (first order) cost in terms of lower social welfare.[9]

From this interpretation, it is intuitive to understand that the distortion increases with the temptation to manipulate voters which, in turn, depends on both the concern of parties to win the election (ρ) and the fraction of voters ($1 - \sigma$) that can be potentially manipulated. In the remainder of the paper we refer to ρ as the *incentive* to manipulate voters' beliefs and to $1 - \sigma$ as the *scope* for manipulation. The following equations summarize the impact of ρ and σ on the distortion and the size of public balance:

$$\frac{ds_j}{d\rho} = -\frac{\bar{z}(1 - \sigma)}{(\bar{z} + \sigma\rho)^2} < 0 \qquad\qquad \frac{ds_j}{d\sigma} = \rho\frac{\bar{z} + \rho}{(\bar{z} + \sigma\rho)^2} > 0 \qquad\qquad (18)$$

$$\frac{d^2 s_j}{d\rho\, d\sigma} = \bar{z}\frac{\bar{z} + \rho(2 - \sigma)}{(\bar{z} + \sigma\rho)^3} > 0 \qquad\qquad (19)$$

Thus, on the basis of the derivatives in eq. (18) we expect a looser policy in countries where parties have a stronger incentive to be in office (high ρ) and where the fraction of informed voters is smaller (low σ). Further, on the basis of eq. (19), the negative impact of the government's incentive

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[9] The equilibrium would exhibit no distortion if parties were able to pre-commit themselves to the socially optimal policy.

to manipulate voters' beliefs is expected to be smoothed in countries with a larger share of informed voters among the population.

III. The empirical analysis

III.A. Data and Model Specification

Our empirical analysis is based on a balanced panel dataset of 23 OECD countries that are observed over the period 1999–2008. The sample coverage in terms of countries and years depends on the data availability about economic literacy and political variables.[10] We use the following baseline specification:

$$BUDGET_{it} = \alpha + \beta \cdot LITERACY_{it-1} + \delta \cdot POLARIZATION_{it-1} + \gamma \cdot (POLARIZATION_{it-1} \cdot LITERACY_{it-1}) + \sum_{j=1}^{N} \theta_j \cdot CONTROLS_{jit-1} + \omega_i + \tau_t + \varepsilon_{it}. \tag{20}$$

Here, *i* denotes the country, *t* the year, and *j* the control variables.

In the most preferred specification, the dependent variable *BUDGET* is the general government's primary balance as percentage of GDP. We rely on the primary balance because it does not include the cost for servicing the debt and, henceforth, it represents a more direct measure of the fiscal policy stance in the hands of politicians. We also use the overall financial balance over GDP for robustness purposes. Further, we test our results when the above two balances are cyclically-adjusted to control for the sensitivity of fiscal outcomes to the aggregate cycle. Finally, we run separate regressions for total outlays and total tax and non-tax receipts – both computed as percentage of GDP – to detect whether the manipulation of voters' beliefs is more likely to occur through the expenditure channel of the budget as opposed to the taxation one. All dependent variables are sourced from the OECD Economic Outlook database (for more details see Table I).

The variable *LITERACY*, which captures the *scope* for manipulating voters' beliefs, is a survey indicator based on the opinions of experts and business leaders who are annually interviewed by the International Institute for Management Development (IMD). Participants are asked to evaluate on a 0–10 scale the sentence "Economic literacy among the population is generally high". Responses are aggregated at country level to provide an overall economic literacy score for the population, and published by the IMD World Competitiveness Yearbook (for more details see Jappelli 2010). In our sample, this variable exhibits a quite high degree of variation both across countries and over time,

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[10] The list of our countries is: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

as shown in Figure I. In detail, values range from 3.01 (Spain in 2008) to 8.16 (Finland in 2003 and Iceland in 2004). Instead, since our sample is only composed of advanced economies, measures of information diffusion are likely to exhibit a low degree of variation. In Figure II and Figure III, we show the time evolution of internet usage and broadband diffusion and – as expected – we detect very small differences across countries in both the levels and the growth rates of such variables.

[Figures I, II and III about here]

Previous studies dealing with the determinants and consequences of economic literacy have used more direct and objective methods to elicit the literacy of individuals.[11] We have opted for the subjective measure computed by the IMD for two reasons. First, the main theoretical argument in our model is that fiscal policy is biased because of the incentive of politicians to be in office and their perception that some voters are economically illiterate. Thus, the *scope* for manipulating voters' beliefs is driven by the perceived economic literacy – and not by the true level of economic literacy.[12] Second, objective measures are so far limited to a few countries and short time periods. In addition, they have been computed with different methods across countries, and thus it is not surprising that the IMD measure has been adopted in other studies dealing with the international heterogeneity of literacy.[13]

The variable *POLARIZATION*, which captures the *incentive* for manipulating voters' beliefs, is a dummy that equals one when cabinet components are ideologically homogeneous – regardless of their right-wing, left-wing or center-oriented ideology. Conversely, the dummy equals zero when the cabinet composition shows some degree of heterogeneity. More in detail, the variable is computed from an index which measures the ideological homogeneity of the cabinet along a three-level scale (Schmidt 1992):[14] hegemony (level 1), dominance (level 2) and balance (level 3). Within a cabinet, an ideology is hegemonic if all cabinet components adhere to it. An ideology is instead dominant if less than one third of cabinet components do not adhere to it. Otherwise, a cabinet is

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[11] Typically, individuals are asked questions on basic concepts such as inflation, interest compounding and risk diversification (Lusardi 2008).

[12] It is worth noting that *LITERACY* is found to be positively correlated across countries with objective measures of educational attainments and cognitive abilities such as the ones derived from the OECD-PISA test scores (see Jappelli 2010).

[13] An alternative measure is contained in the SHARE dataset, which provides detailed information on individual cognitive abilities, including economic and financial competences. Similarly to LITERACY, the SHARE measure comes from a survey investigation. However, this measure is only available for 11 European countries and is less representative than LITERACY as it only covers the population aged 50 and older.

[14] The original index in the Comparative Political Dataset (CPD) is based on a five-level scale. In our sample of 23 advanced economies, we only have three levels.

termed as ideologically balanced. Our dummy *POLARIZATION* equals one if an ideology is hegemonic within the cabinet (i.e. level 1), and zero otherwise (i.e. level 2 or level 3).

Beyond manipulation issues, fiscal policies are driven by a set of 'fundamentals'. In our theoretical model, such fundamentals are embedded in preferences and technological constraints as well as in the parameter *T*. Since these fundamentals change across countries and over time, their impact is investigated and estimated.

Drawing upon the interpretation of the parameter *T*, we insert the debt-to-GDP ratio (*DEBT*) and the long-term interest rate on the stock of debt (*INTEREST*) as the main fundamentals that potentially affect the sustainability of debt. On the one hand, both variables should exert a disciplining impact on fiscal policies – due to fiscal prudence motivations and the scrutiny of international financial markets. On the other hand, governments may react to large debt/GDP ratios through expansionary fiscal measures to stimulate the economy (Mauro et al. 2015).

Away from normal times, fiscal policies are expected to smooth the economic cycle through automatic mechanisms and discretionary budgetary measures. Hence, to capture the impact of the cycle, we include the unemployment rate (*UNEMP*), the annual growth rate of real GDP per capita (*GDP GROWTH*), and the inflation rate – measured as the annual growth rate of the consumer price index.

We also account for other potential determinants of fiscal policies, as suggested by the literature. First, we include the degree of openness to external trade, as measured by the sum of imports and exports over GDP (*OPEN*). Openness may be positively associated with the budget balance because of the effect of foreign direct investments on government revenues. However, more open economies can also be more prone to fiscal profligacy if they attempt to attract investors through corporate tax benefits.

Second, we include the population (*POP*) to account for possible country-size effects, especially in the expenditure side of the budget. On the one hand, larger countries may exhibit lower expenditures to GDP ratios if the production of public goods is characterized by scale economies. On the other hand, a larger population implies more heterogeneous preferences and the quest for a wider variety of public goods. As a result, the production of public goods may turn out to be less efficient.

Third, the specific cognitive skills that are relevant for electoral behavior might also be captured through a general measure of voters' education. However, the notions of economic literacy and education should not be confused and overlapped (Lusardi and Mitchell 2014). In fact, substantial individual heterogeneity in economic competences remains at every level of education. To empirically deal with these issues, we control for the average number of years of education for

individuals aged 25 and older (*EDUCATION*).[15] In the robustness section, we also replace *LITERACY* with *EDUCATION* to prove that the two variables measure different individual abilities and our main results are not driven by country-level educational achievements.

Finally, politicians and bureaucrats may use their discretion to extract rents and get personal gains. We would therefore expect more fiscal profligacy in more corrupt countries, which are usually characterized by weaker institutions. To capture this mechanism, we use an index of perceived corruption in the public sector (*CPI*) – defined as the abuse of public office for private gains. The index quantifies and aggregates perceptions of corruption expressed by a country's population, and it ranges between 0 (pervasive corruption) and 10 (no corruption) in our sample.[16] Variables' definitions, sources and summary statistics are reported in Table I.

[Table I about here]

All the right-hand-side variables are included at year *t-1* as the budget balance at time *t* is normally planned on the basis of the previous year's socio-economic information. More generally, a lag between fiscal outcome and its determinants is likely to occur due to adjustment mechanisms during the policy-making process (Barro and Lee 2005). Further, the use of lagged values of explanatory variables allows us to alleviate potential reverse causality issues (Pepinsky and Masaki 2016).

Eq. (20) includes country-specific time-invariant effects (ω_i), time effects (τ_t), and the idiosyncratic component (ε_{it}). We estimate our models by means of panel fixed-effects (FE) estimators with heteroscedasticity-robust standard errors.[17]

III.B. Main Results

Table II shows our empirical results when the dependent variable is the general government's primary balance over GDP.

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[15] In our sample the correlation between *LITERACY* and *EDUCATION* is actually not negligible (0.61).

[16] A similar approach has been adopted by Shi and Svensson (2006), who use an index measuring a country's "degree of corruption as seen by business people and risk analysts". The authors consider other five institutional indicators designed to provide private investors with measures of governmental rent-seeking activities. As they point out, all these variables "are subjective measures of corruption in general and not specifically a measure of politicians' rents of being in power. However, to the extent that corruption reflects an underlying institutional framework, different forms of corruption are likely to be correlated" (p. 1380). The underlying assumption is that such indices capture the incentive to manipulate voters' beliefs. Politicians are expected to manipulate voters' beliefs more intensively in more corrupt environments, because being in power in these environments affords larger personal gains. However, while this argument is reasonable in the sample used by Shi and Svensson – that includes advanced and developing countries – it appears to be less compelling in our sample of advanced countries, where formal and informal institutions are in general more effective in limiting the extraction of personal rents.

[17] The FE estimator is more efficient than the first-differences OLS one (Wooldridge 2002). Moreover, in our data setting, first-differences OLS estimator shows a "too short memory" problem (Laporte and Windmeijer 2005).

[Table II about here]

In column (1) we only insert the variables related to the scope and incentive for manipulating voters' beliefs (*LITERACY* and *POLARIZATION*, respectively) and their interaction. In column (2) we extend the model specification to account for the main fundamentals of fiscal policy (*DEBT* and *INTEREST*). In column (3) we add the variables related to the economic cycle (*UNEMP*, *GDP GROWTH* and *INFLATION*). Finally, in the last columns we sequentially add *OPEN* and *POP* (column (4))*, EDUCATION* (column (5)) and *CPI* (column (6)).

Across the different specifications, the estimated coefficients of the variables related to the incentive and scope for manipulating voters' beliefs are consistent with our theoretical priors. The estimated impact of *POLARIZATION* ranges between -2.51% (significant at 5%) in column (5) and -6.07% (significant at 10%) in column (1). This impact refers to a situation where *LITERACY* equals zero. However, in our sample this value of *LITERACY* is not observed as its minimum is 3.01. At this minimum level, the marginal effect of *POLARIZATION* on the primary balance over GDP is still statistically significant and negative – ranging from -1.01% in column (5) to -2.55% in column (1) – but with a lower magnitude than before. This suggests that passing from a null economic literacy to a minimum level of economic literacy contributes to lower the government's scope to manipulate voters' beliefs. In the same way, for increasing values of *LITERACY* the overall effect of *POLARIZATION* on the primary balance over GDP becomes negligible, i.e. the term $(\delta + \gamma \cdot LITERACY)$ becomes not statistically significant at conventional confidence levels.[18]

To sum up, polarized governments are associated with less fiscal discipline in countries with low levels of economic literacy. Conversely, in countries with high economic literacy, polarization does not affect public finance outcomes. Our evidence is thus consistent with the view that government polarization tends to loosen fiscal policy if and only if there is enough scope for manipulating voters' beliefs.

In the same vein, economic literacy seems to impose fiscal discipline only in countries where the political environment is polarized and, as a consequence, where there are incentives for manipulating voters' beliefs. More in detail, since *POLARIZATION* is a dummy, β conveys the impact of *LITERACY* under no polarization, while $\beta+\gamma$ conveys the same impact under polarization. Results show that while β is consistently not significant across specifications, the sum $\beta+\gamma$ is statistically positive at conventional significance levels in all regressions.

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[18] Additionally, for very high values of *LITERACY* (i.e. beyond the 83rd percentile), the sum $(\delta + \gamma \cdot LITERACY)$ turns out to have a positive statistically significant impact on the primary balance over GDP.

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As to the control variables, estimated coefficients are largely consistent with theoretical priors and quite stable across model specifications. In detail, high public debt-to-GDP ratios provide an incentive to fiscal discipline (Bohn 1998). Likewise, economic growth improves the primary balance over GDP (Lane 2003). This confirms that the fundamental drivers of fiscal policy are at work. Public budgets tend to improve with the intensity of external trade (Corsetti and Müller 2008), while larger countries tend to show a worse fiscal stance. Finally, a lower perceived corruption is associated with tighter fiscal policies (Arin et al. 2011).

In Table III we use the overall financial balance over GDP instead of the primary budget as dependent variable. Results are fully in line with those of Table II. This is due to the fact that payments for debt servicing are largely stable within countries in the decade under scrutiny, and thus the cross-country heterogeneity in debt servicing turns out to be part of the fixed effect. In fact, the two balance variables are highly correlated: their pairwise correlation is 0.91 and it is statistically significant at 1%.

[Table III about here]

One potential concern is that our results may be driven by the correlation between our main explanatory variables and the cyclical component of the primary (and overall) balance. Thus, we replace the two observed balance measures with the cyclically-adjusted counterparts. Results are reported in Tables B.I and B.II in the Appendix B and confirm the main findings of Tables II and III. Hence, our results do not seem driven by the budget response to the aggregate economic conditions.

Due to the assumption of perfect complementarity between private and public consumption, in the theoretical model the manipulation of voters' beliefs is implicitly conducted with the same intensity along the two budget components: taxes and expenditures. However, these two channels may be used with different intensity in the real world. To this extent, in Table IV we split the budget balance into its two components – total outlays, and total tax and non-tax receipts – and run separate regressions based on the most comprehensive model specifications in Table II (i.e. the last three columns). This way, we try to identify the channels through which the incentive and scope for manipulating voters' beliefs materialize. As to the total outlays (columns (1)-(3)), we get no results about *POLARIZATION* and its interaction with *LITERACY*. By contrast, in columns (4)-(6) we find a negative coefficient of *POLARIZATION* on the government's revenues – ranging from -1.44% in column (5) to -1.72% in column (6) – and a positive and statistically significant coefficient of the interaction term between *LITERACY* and *POLARIZATION*. Passing from totally illiterate to

partially economically literate voters, a "smooth effect" of economic literacy on the "revenue-reduction" behavior of polarized governments seems to appear. In detail, at the minimum value of *LITERACY* over the whole sample, the overall effect of *POLARIZATION* on tax and non-tax revenues is still negative, but with a lower magnitude (i.e. -0.45% in column (5) and -0.58% in column (6)).

[Table IV about here]

To sum up, results in Table IV show that government polarization is not associated with changes in public expenditures whichever the level of voters' economic literacy. Conversely, polarization is negatively associated with tax and non-tax receipts in countries with low levels of economic literacy. This suggests that voters are believed to be more sensitive to tax reductions than to expenditure expansions. Accordingly, at low levels of economic literacy, manipulation leads to less fiscal discipline on the revenue side rather than on the expenditure side.[19]

The explanation of the above findings is threefold and reflects past political decisions. First, government expenditures are usually more sticky than government revenues, and so expenditures are more difficult to change if compared to revenues. Second, reductions in government revenues (in particular taxes) are "more visible" (and immediately perceived) by voters than the (additional) provision of in-kind transfers or public service facilities/infrastructures. This higher visibility leads to a higher influence on the behavior of voters. Further, the monetary nature of tax reductions translates into an immediate benefit for the voter (if subjected to the tax shock), and thus into a higher impact on the voter's utility function. Third, tax shock announcements are easier to monitor for voters than changes in government expenditures, even for economically literate voters. This relates to the complexity of the budgets of advanced economies (Alesina and Perotti 1996), and to the difficulty to assess the whole welfare effect of an expenditure shock.

IV. Robustness checks

In this work we implement three types of robustness checks. The first type is about the incentive for manipulating voters' beliefs. Specifically, we check whether the relationship between government polarization and fiscal discipline is driven by cross-country heterogeneity in both electoral and institutional systems. The second type relates to the scope for manipulating voters' beliefs.

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[19] This is in line with the findings of Brender and Drazen (2008), who suggest that voters may be more sensitive to tax reductions than to expenditure increases.

Accordingly, we test if our measure of economic literacy is a reliable proxy of voters' skills to assess the ability of politicians (by processing related information), and if the correlation we found with fiscal discipline is spurious. Finally, the last type of check tests whether our results are driven by either budget time dynamics or unobserved heterogeneity - between the incentive and the scope for manipulating voters' beliefs and variables which are omitted in our models but potentially correlated with fiscal balance.

IV.A. Incentive for manipulating voters' beliefs

To check whether our results are driven by confounding factors such as cross-country heterogeneity in either electoral or institutional systems, we implement the following set of robustness checks. First, we remove presidential democracies (i.e. France, Switzerland, the United States) from our sample. The rationale is that, in presidential systems, cabinets in office are led by the President (who is directly elected by voters), and thus – differently from parliamentary systems – the executive branch is separated by the legislature branch. We expect that in presidential systems cabinets are more polarized, and thus they may drive our results. Instead, the results (available upon request) turn out to be fully in line with the main models. This would suggest that our findings are not affected by the dichotomy between parliamentary and presidential regimes.

Second, we split our sample between (constitutional/parliamentary) monarchies and republics.[20] Even though in almost all parliamentary monarchies in our sample the Royal Family has been experiencing a drastic reduction of its powers – e.g. appointment of governments, termination of parliaments –, many parliaments in constitutional monarchies are partially non-voted (e.g. the Chamber of Lords in the UK). This non-voted part of the parliament may interfere with the voted part of the parliament by means of veto rights or other "softer actions", and thus influence the behavior of the elected government. Hence, after the election, (even) strongly cohesive governments could have less freedom to put forward the policies they announced before the elections. As expected, our main results are confirmed for the republics, whereas they do not hold for the monarchies.

Third, we remove majoritarian democracies (i.e. Australia, Canada, France, New Zealand, the United Kingdom, and the United States). Following Persson and Tabellini (1999), one might theoretically expect that majoritarian systems, as opposed to the proportional ones, increase competition between parties in certain "marginal" electoral districts, leading to a more targeted wealth redistribution. Put differently, majoritarian systems are usually more effective in

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[20] Among monarchies we have: Australia, Belgium, Canada, Denmark, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Spain, Sweden and the United Kingdom. The rest of the countries in the sample are coded as republics. The results are available upon request.

administering public budgets because of a smoothing of the 'common pool' distortion – i.e. excessive spending when expenditure items benefit single constituencies but are financed by all voters. Estimations (available upon request) without countries with majoritarian electoral rules confirm that our main findings do not seem to be driven by the electoral system regime.

Finally, in the contributions close to ours (e.g., Shi and Svensson 2006), the incentive to win the election is ascribed to the ability of politicians to extract rents once in office. Accordingly, this incentive is captured by some indexes of perceived corruption, which measure how much public officials can exploit their position for private benefits. Hence, perceived corruption might play the same role of polarization as a determinant of the *incentive* to manipulate voters' beliefs. We estimate Eq. (20) by replacing *POLARIZATION* with the *CPI* index, and the results (available upon request) confirm that the two variables address different issues. Indeed, coefficients of *CPI* and its interaction with *LITERACY* are not statistically significant at conventional levels across different specifications.

IV.B. Scope for manipulating voters' beliefs

The first robustness check on the scope for manipulating voters' beliefs consists in substituting the variable *LITERACY* with *EDUCATION* in Eq. (20) to test whether economic literacy is a reliable proxy of voters' skill to assess the ability of politicians or – instead – a mere proxy of general knowledge. Results are shown in Appendix B (Table B.III) and confirm that the two variables capture different aspects of voters' skills and competences. Indeed, when the level of individuals' general education is used, instead of their economic competence, our main results do not hold. Coefficients of *POLARIZATION* and its interaction with *EDUCATION* are not statistically significant across specifications. This is consistent with the core assumption of our argument: the asymmetric information between voters and politicians depends on the voters' economic knowledge rather than on their general knowledge.

The second robustness check deals with the potentially spurious correlation between voters' economic literacy and fiscal discipline. In this perspective, we use three falsification tests and randomize the variable *LITERACY* across: i) pooled observations in the dataset; ii) years within countries; and iii) countries within years. As expected, our main results vanish. This seems to exclude that the causality we found is spurious. Results of the more general test i) are reported in Appendix B (Table B.IV).

IV.C. Budget time dynamics and unobserved heterogeneity

In Eq. (20) we assume a static model specification where *BUDGET* at time *t* is a function of some regressors at time *t-1*, but *BUDGET* at time *t* does not depend on *BUDGET* at time *t-1*. To control whether our results are driven by the above assumption we estimate the following equation:[21]

$$BUDGET_{it} = \alpha + \rho \cdot BUDGET_{it-1} + \beta \cdot LITERACY_{it-1} + \delta \cdot POLARIZATION_{it-1} + \gamma \cdot$$
$$(POLARIZATION_{it-1} \cdot LITERACY_{it-1}) + \sum_{j=1}^{N} \theta_j \cdot CONTROLS_{jit-1} + \omega_i + \tau_t + \varepsilon_{it}; \qquad (21)$$

where the variable *BUDGET$_{it-1}$* is the general government's primary balance as percentage of GDP at time *t-1*.[22] To control for a potential dynamic bias, we estimate Eq. (21) by means of two-step system generalized method of moments (GMM) approach (Blundell and Bond 1998) with finite-sample correction for the two-step covariance matrix (Windmeijer 2005). We run several types of GMM estimators. First, we use several combinations of reduced instrument sets, with moment conditions for instruments in levels in the time interval between *t-2* or *t-3* and *t-4* or *t-5*. The use of this time-lag structure allows us to reduce potential finite sample bias, which is more likely when using a large number of instruments (Roodman, 2009). Further, shorter time lags reduce measurement errors that could lead to biased estimates (Bond 2002). Second, as suggested by Roodman (2009), we use the full time series of the available moment conditions, but we 'collapse the blocks' in the instrument matrix.[23] Hansen tests on the validity of instruments and pseudo-first stage regressions on the goodness of instruments – in levels and differences – reveal the soundness of estimates. The results (available upon request) turn out to be fully in line with the main models. This would suggest that our findings are not affected by time dynamics in the budget process formation.

Finally, we test for potential unobserved heterogeneity between the incentive and/or the scope for manipulating voters' beliefs (*POLARIZATION* and *LITERACY)* and our dependent variable (*BUDGET*). The impacts of *POLARIZATION, LITERACY* and their interaction on our dependent variable are in fact consistent if and only if *POLARIZATION, LITERACY* and their interaction are uncorrelated with unobserved components of *BUDGET*. As suggested by Chetty et al. (2011), a natural test of this identifying assumption is to estimate the correlation between *POLARIZATION, LITERACY* and their interaction, and variables which are initially omitted in our models – but

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[21] It should be noted that the stickiness of fiscal outcomes is usually more troubling with stock variables than with flow variables.

[22] For robustness purposes, we also use the overall financial balance over GDP, or the cyclically-adjusted primary and overall balances over GDP, as above.

[23] We also use small-sample corrections for estimating standard errors. The results are almost unchanged and are available upon request.

potentially correlated with fiscal balance (see also Altonji et al. 2005; Chetty et al. 2014a, 2014b). As variables to evaluate potential selection bias we choose two variables: i) the interaction between country size (i.e. land area in squared kilometers; source: the World Bank – Food and Agriculture Organization) and political stability (source: the World Bank – Governance Indicators); and ii) ethnic fractionalization (Alesina et al. 2003).[24]

As to the first "initially unobserved" determinant of *BUDGET*, land area is normally used as proxy of fiscal decentralization as larger countries exhibit a higher degree of fiscal decentralization (Panizza 1999). To this extent, the fiscal federalism literature suggests that more decentralization would lead to less government's fiscal discipline (Velasco 2000). As to the political stability, Alesina and Tabellini (1990a) show that lower political stability – as proxied by conflicts among different groups of citizens – leads to less country's fiscal discipline (see also Alesina and Perotti 1995). Finally, regarding the interaction between fiscal decentralization and the political stability, Huther and Shah (1998) show that there is a positive correlation among them. Thus, we choose to use their interaction because the extant literature does not prove causation between them, but, at the same time, these two variables may reinforce each other in determining the country's fiscal policy stance.

The second "initially unobserved" determinant of *BUDGET* is ethnic fractionalization. Alesina, Baqir, and Easterly (1999) show that "fiscal discipline is more problematic in ethnically fragmented localities" (p. 1254). Moreover, ethnic fractionalization influences the composition of public expenses, i.e. more ethnically fragmented countries show a lower share of public goods spending. We do not interact ethnic fractionalization with country size and/or political stability because – to the best of our knowledge – the extant literature does not show potential direct interactions among them in explaining the government's fiscal discipline. For instance, Easterly and Levine (1997) show that ethnic fractionalization influences a country's economic performance, which is associated with political stability – but there are no direct interactions between ethnic fractionalization and political stability.

It is worth noting that reverse causality between a country's public budget and its determinants (i.e. fiscal decentralization, political stability, ethnic fractionalization) is very unlikely (for more details, see Acemoglu, Johnson and Robinson 2005).

As regards the empirical implementation of the above procedure, we implement the tests proposed by Chetty et al. (2011) that are more suitable for our research setting. First, for each year of our sample we estimated OLS regressions where the dependent variable is the primary budget

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[24] Ethnic fractionalization "measures the probability that two randomly selected individuals in a country belong to different ethnolinguistic groups" (Easterly and Levine 1997; p. 1206).

and the covariates are the above two variables to evaluate potential selection bias. Then, we show the lack of any statistically significant correlation (at 1% level) between *POLARIZATION*, *LITERACY* and their interaction, and the predicted value of primary balance based on the above OLS estimations. This is reported in Table B.V. Thus, the first test on our identifying assumption holds.

Second, we estimate our main models by substituting the dependent variable (*PRIMARY BALANCE*) with its predicted value (*Predicted PRIMARY BALANCE*). In this case we find that our main results do not hold, and thus our baseline results do not seem to be driven by unobserved correlation between fiscal budget and its components. Finally, we include the *Predicted PRIMARY BALANCE* in our main models, and we find that: i) this predicted balance is strongly significant, meaning that the variables to evaluate potential selection bias are strong predictors of the fiscal budget; but ii) our main results hold, and thus the degree of bias in our baseline models is likely to be small. The last two estimates are reported in Table B.VI.

To sum up, these three tests show that the potential unobserved heterogeneity between the incentive and/or the scope for manipulating voters' beliefs and fiscal discipline is likely to be small in our sample, and thus the identifying assumption used in the estimation of Eq. (20) holds.

V. Additional evidence

Many empirical contributions argue that the government's ideology influences public policies (Schmidt 1996; see also Potrafke 2016 for a new survey on OECD countries). However, empirical evidence is not unanimous on the effect of the government's ideology on a country's fiscal policy stance. For instance, left-wing governments do not seem to increase public debt and budget deficits (Alesina et al. 1999) and, when it happens, such increase depends on the negative economic conditions (e.g. Cusack 1999). More recently, Raess and Pontusson (2015) and Müller, Storesletten and Zilibotti (2016) have investigated whether the government's ideology influences fiscal policies in OECD countries during the financial crisis started in 2007. The former find that the government's ideology hardly influences any of the fiscal stimulus packages in the 2008-2009 recession. The latter conclude that the government's ideology did not help to predict budget deficits.

To test whether the government's ideology matters in our framework we estimate Eq. (20) and replace the variable *POLARIZATION* with three dummies accounting for the political ideology within cohesive governments:[25] "Left" denotes social democratic parties and political parties to the

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[25] The three dummies can be included together in the regressions as they are mutually exclusive.

left of social democrats; "Right" denotes liberal and conservative parties; and "Center" denotes center parties (in particular Christian Democratic and Catholic parties).[26]

Results on primary balance over GDP and overall financial balance over GDP are reported in Tables V and VI, respectively. In both cases, the baseline findings only hold in the case of right-hegemony (*RIGHT POLARIZATION*) and its interaction with the level of economic literacy. Conversely, no statistically significant results emerge for the other two types of hegemonies in polarized governments.

[Tables V & VI about here]

These results are consistent with previous contributions (e.g., Persson and Svensson 1989; Alesina and Tabellini 1990b; Alt and Lassen 2006) arguing that right-wing governments tend to have higher deficits than left-wing governments. One possible explanation is the pursuit of strategic goals – that is, to reduce the possibilities for spending should a successor government be left-wing. Another explanation provided by Song, Kijetil and Zilibotti (2012) and Alesina and Passalacqua (2015) is that when right-wing parties are in power, they are less concerned with the provision of public goods in the future but they are more likely to push up current debt today in order to use the resources as subsidies for private consumption. In other words, right-wing governments run larger deficits and accumulate more debt because increasing debt today can finance a current tax break at the cost of crowding out future public goods' provision. Such cost is likely to be of little importance to right-wing voters.

VI. Conclusions

After decades of research, economists now take for granted that the pursuit of political objectives leads to higher public deficits and debts than would be suggested by economic rationality. However, the mechanisms through which this political influence unfolds are still under scrutiny. Early studies claim that such mechanisms rely on a deviation from full rationality. Voters fail to understand that large current deficits induce a temporary demand expansion at the cost of a future demand contraction (Buchannan and Wagner 1977). As a consequence, politicians tend to behave strategically fostering large deficits and avoid to implement fiscal consolidation plans.

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[26] According to Schmidt (1996: 160), center parties favor a "moderate social amelioration in a location to the left of conservative or conservative-neoliberal parties."

Conversely, more recent studies have devised a set of mechanisms, which are fully consistent with voters' rationality. According to them, politicians use their budget discretion to 'tie the hands' of future opponent cabinets (Alesina and Tabellini 1990a), manipulate the beliefs of imperfectly informed voters (Rogoff 1990), and redistribute resources across constituencies (Battaglini and Coate 2008) or generations (Song, Kijetil and Zilibotti 2012).

This work draws upon this second strand of literature borrowing two key ideas. First, in line with Rogoff (1990), we assume that voters are imperfectly informed on the ability of politicians, so that these latter manipulate citizens' beliefs to gain consensus. Second, close to the spirit of Alesina and Tabellini (1990a), we hold that consensus is more valuable if political competitors are ideologically distant. Accordingly, we assume that the incentive to manipulate voters' beliefs increases with the ideological polarization of cabinets.

The main contribution of this work to the literature relates to the mechanism that lies at the heart of voters' imperfect information. We argue that voters are able to make an informed judgement on the ability of politicians only if they possess an adequate economic knowledge. Ludwig von Mises (1949) would agree with our assumption that imperfect information depends on the extent of voters' economic competence: "All present-day political issues concern problems commonly called economic. …... In joining a political party and in casting his ballot, the citizen implicitly takes a stand upon essential economic theories" (chapter 38).

Building on the above assumption, we build a formal model and predict that the current fiscal balance exhibits a downward bias with respect to the optimal balance. Further, this bias depends on the interaction between the incentive of politicians to be in office – i.e. cabinet polarization – and their perceived level of voters' economic knowledge. For a given level of economic knowledge, the fiscal balance is expected to worsen with the government polarization. In addition, this relationship is expected to become weaker as economic knowledge becomes more diffuse among voters.

We test our theoretical predictions on a sample of 23 OECD countries that are observed over the 1999-2008 period, so exploiting time and cross-country variability of the key variables. By controlling for potentially confounding differences across countries and over time, falsification tests, time dynamics and unobserved heterogeneity, we document that the main theoretical predictions are empirically consistent.

It is worth noting that our empirical evidence can also be interpreted by appealing to the monitoring activity of citizens over political and administrative decisions. For instance, Glaeser, Ponzetto and Shleifer (2007) develop a theoretical model showing that general education is highly correlated with the level of democracy. Drago, Nannicini and Sobbrio (2014) show that an increased information diffusion leads to a higher participation (turnout) in municipal elections, and

to a higher efficiency of the local government. Bobonis, Cámara Fuertes and Schwabe (2016) use data on municipalities in Puerto Rico and show that timely audits before elections enable voters to select less corrupt politicians. In our research setting, one may argue that governments in power, especially if strongly cohesive, tend to exploit their discretion to benefit themselves or their constituencies with a direct negative backlash on public finance outcomes. Accordingly, citizens and political oppositions have an incentive to monitor the government's decisions. However, the higher is the cabinet polarization, the higher is the lack of monitoring potentially exerted by other parties or minority parties inside the coalition and, as a consequence, the higher is the government' incentive to deviate from socially optimal policies. Thus, a sort of external (to the parliament) monitoring device that leads polarized governments to be fiscally disciplined may be represented by the voters' specific competences. Namely, economic literacy enhances voters to effectively monitor governments in office, especially if these governments may escape the monitoring of other parties, or minority parties inside the coalition. In sum, in democracies whereas economic competence is perceived as more diffuse among the voting population, politicians have less discretion and are forced to pay more attention to the social welfare.

Future works should deepen our evidence by matching the economic literacy of voters with that of politicians. Several mechanisms may be at work. On the one hand, the monitoring of economically literate voters may be more relevant for economically illiterate governments in office. On the other hand, economically literate voters may be more able to choose economically literate politicians and, thus, we expect a positive correlation between the economic literacy of voters with that of the government members in office. If it would be the case, future researchers need to disentangle the pure selection of politicians before elections with the change in the literacy of government members – by means of their turnover – as a response to the monitoring of voters.

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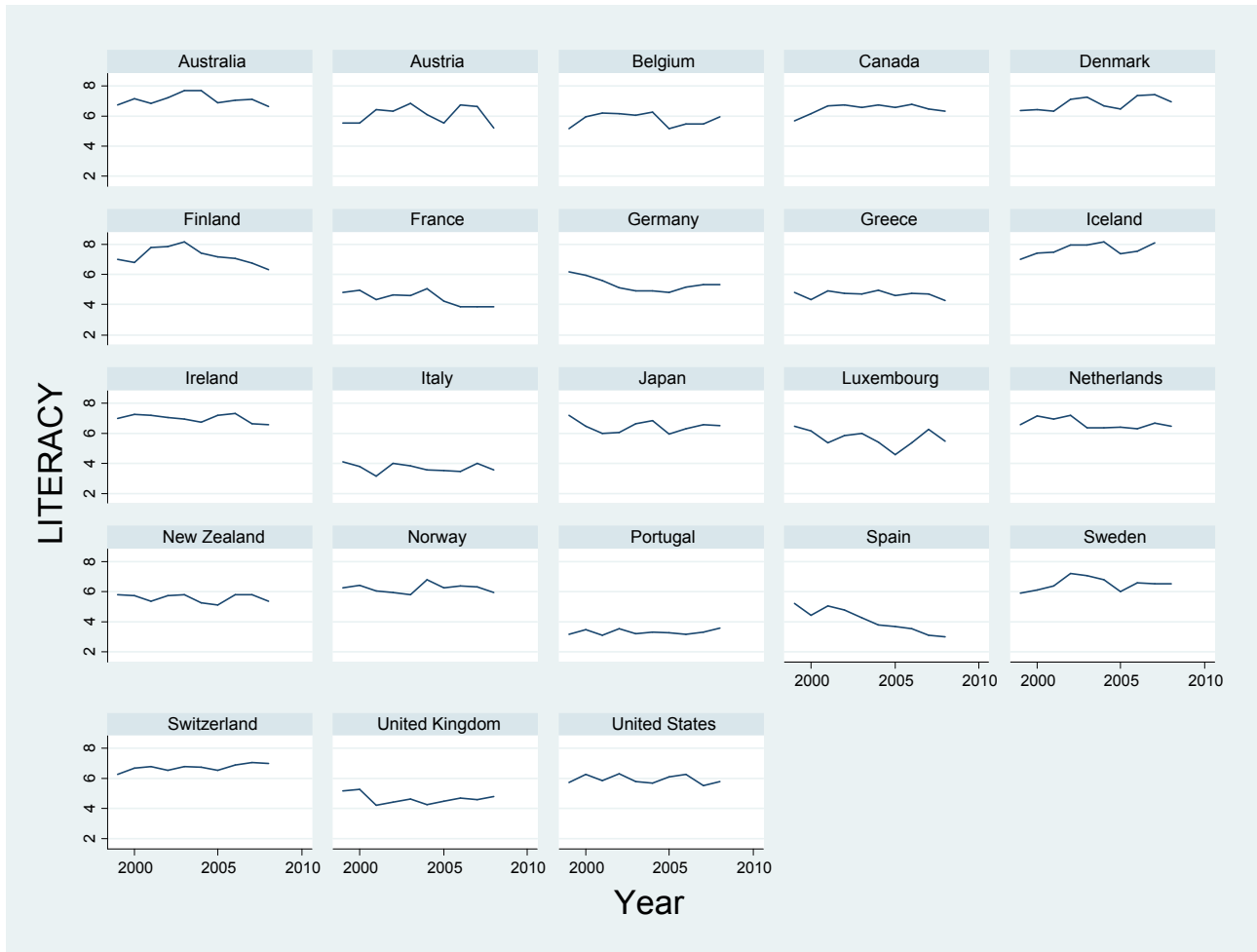
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Figures

Figure I – Economic literacy by country (average values, 1999–2008).

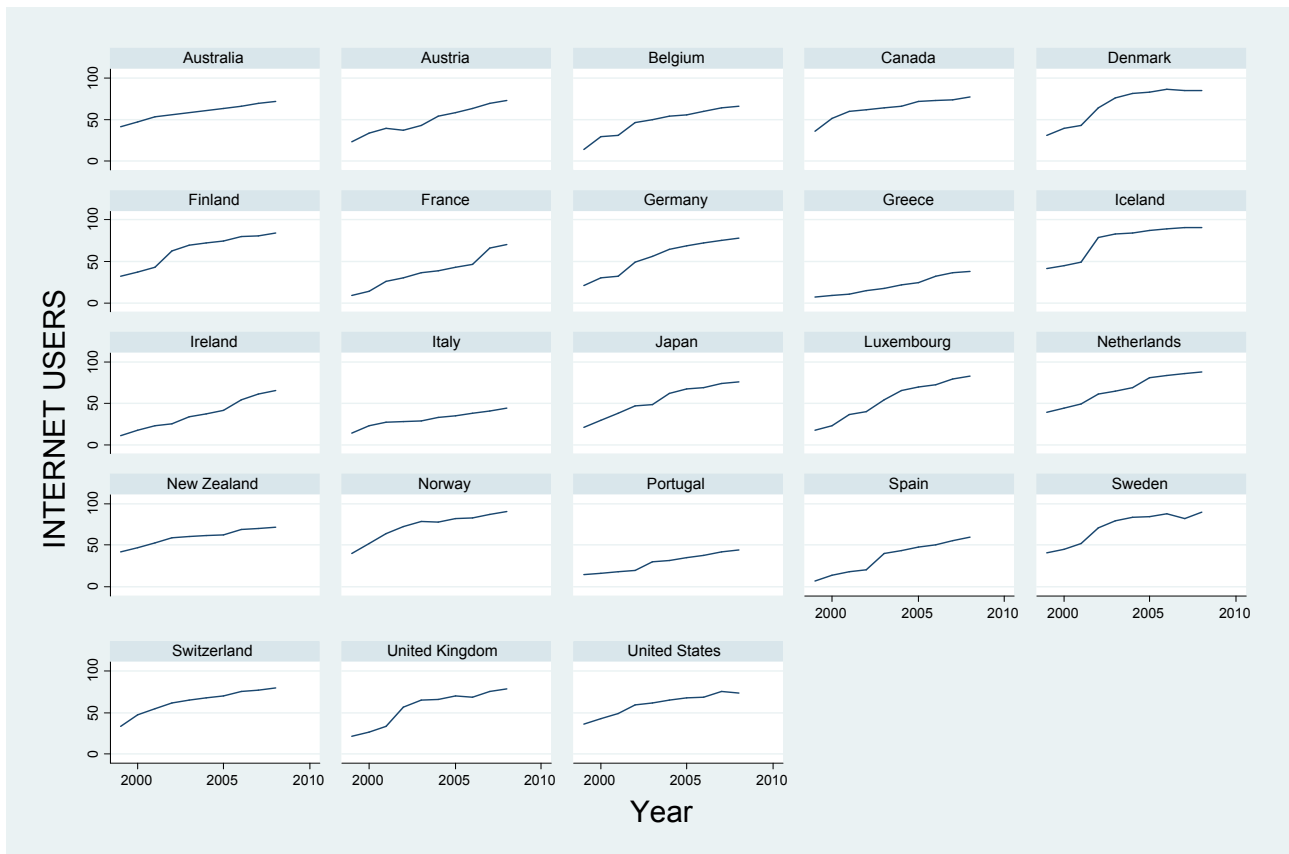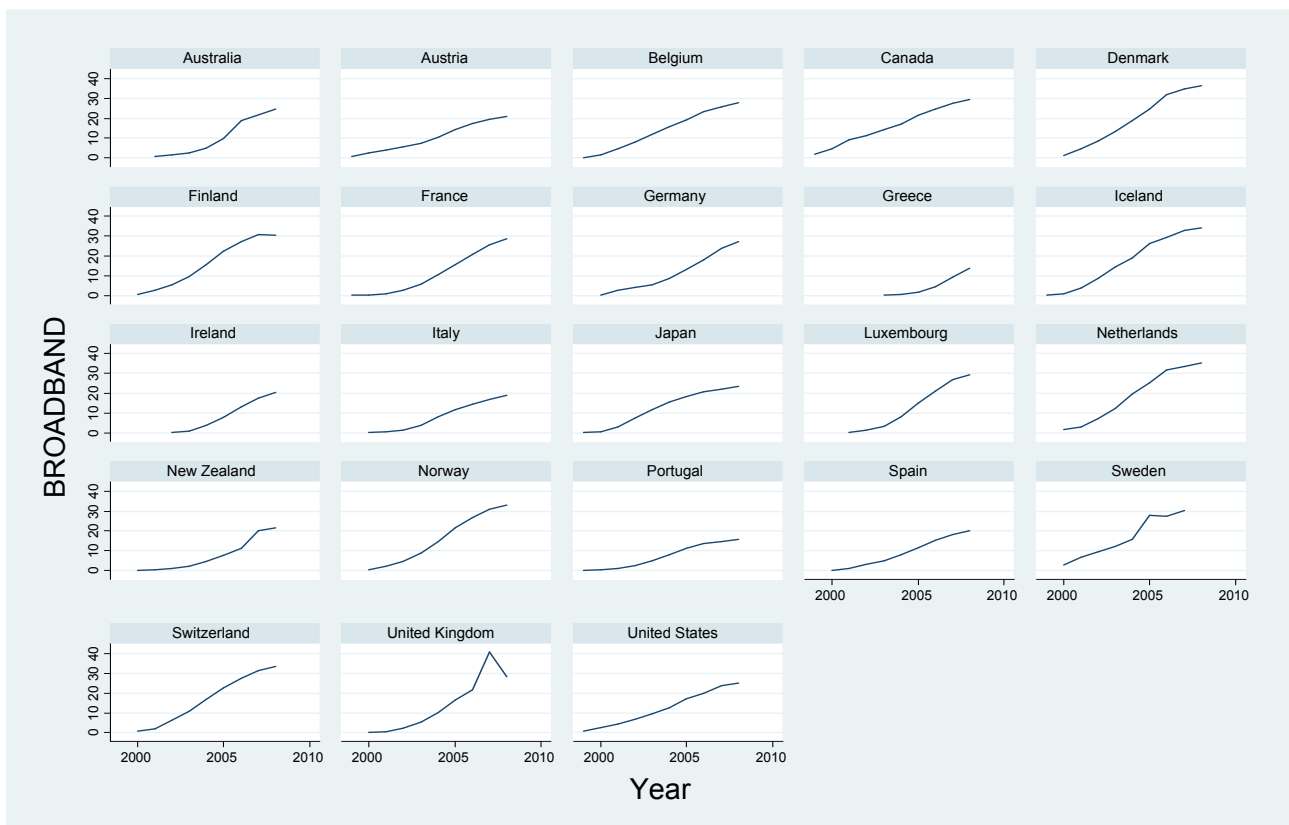Figure II – Internet users by country (average values, 1999–2008).

Figure III – Broadband subscribers by country (average values, 1999–2008).

Notes: Authors' elaboration on World Development Indicators (Source: World Bank).

Tables

Table I – Variables' definition and descriptive statistics

Variables	Definition	Source	Mean	Std. Dev.	Min	Max
PRIMARY BALANCE	Government primary balance (excluding net interest payments), % GDP.	*OECD Economic Outlook*	1.673	3.672	-13.528	16.102
OVERALL FINANCIAL BALANCE	Government financial balance, % GDP.	*OECD Economic Outlook*	-0.039	4.379	-13.507	18.787
TOTAL OUTLAYS	Government total outlays, % GDP.	*OECD Economic Outlook*	43.644	6.521	31.219	58.112
TOTAL TAX & NO-TAX RECEIPTS	Government total tax and non-tax receipts, % GDP.	*OECD Economic Outlook*	43.606	7.399	30.121	58.898
LITERACY	Economic literacy. Survey indicator (on a 0-10 scale) based on the opinions of experts and business insiders being interviewed on the sentence "Economic literacy among the population is generally high".	*World Competitiveness Yearbook*	5.820	1.227	3.010	8.160
POLARIZATION	Dummy equal to 1 if hegemony in the cabinet composition	*Elaborations on Comparative Political Dataset*	0.661	0.474	0.000	1.000
DEBT	Gross government debt (financial liabilities), % GDP.	*OECD Economic Outlook*	65.272	33.032	11.280	171.128
INTEREST	Long-term interest rate on government bonds.	*OECD Economic Outlook*	4.651	1.435	1.003	11.195
UNEMP	Unemployment rate as a percentage of civilian labour force.	*OECD Employment and Labour Market Statistics*	5.964	2.493	2.007	15.692
GDP GROWTH	Annual percentage growth rate of GDP per capita based on constant local currency.	*OECD Main Economic Indicators*	1.971	1.760	-4.507	9.484
INFLATION	Growth of consumer price index (CPI), all items, percent change from previous year.	*OECD Main Economic Indicators*	2.359	1.403	-0.900	12.655

OPEN	Total trade (sum of import and export), % GDP, in current prices.	*Penn World Table 8.0*	85.576	54.435	18.756	319.554
POP	Total population (millions)	*OECD Employment and Labour Market Statistics*	37.842	62.650	0.277	304.094
EDUCATION	Average number of years of education of women and men aged 25 and older.	*Gakidou et al. (2010)*	22.518	3.269	12.500	28.200
CPI	Corruption perception index. Score relates to perceptions of the degree of corruption seen by business people, risk analysts and the general public (0 = highly corrupt; 10 = highly clean).	*Transparency International Organization*	7.943	1.403	4.200	10.000
CYCLICALLY-ADJUSTED PRIMARY BALANCE	Cyclically adjusted government primary balance (excluding net interest payments), % potential GDP.	*OECD Economic Outlook*	0.388	2.994	-17.532	7.899
CYCLICALLY-ADJUSTED OVERALL BALANCE	Cyclically-adjusted government financial balance, % potential GDP.	*OECD Economic Outlook*	-1.309	3.149	-16.318	6.261
RIGHT POLARIZATION	Dummy equal to 1 if right hegemony in the cabinet composition	*Elaborations on Comparative Political Dataset*	0.296	0.457	0.000	1.000
CENTER POLARIZATION	Dummy equal to 1 if center hegemony in the cabinet composition	*Elaborations on Comparative Political Dataset*	0.100	0.301	0.000	1.000
LEFT POLARIZATION	Dummy equal to 1 if left hegemony in the cabinet composition	*Elaborations on Comparative Political Dataset*	0.217	0.413	0.000	1.000

Notes: Summary statistics are provided on a yearly base for the whole sample.

Table II – Primary balance, government polarization and economic literacy

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
			Dep. Var.: PRIMARY BALANCE (% GDP)			
$LITERACY_{t-1}$	-0.29	-0.20	-0.26	-0.24	0.40	0.38
	(0.71)	(0.68)	(0.71)	(0.71)	(0.53)	(0.50)
$POLARIZATION_{t-1}$	-6.07*	-5.85*	-5.60*	-5.35*	-2.51**	-3.12**
	(3.23)	(2.96)	(2.84)	(2.78)	(1.17)	(1.19)
$(POLARIZATION*LITERACY)_{t-1}$	1.17*	1.16*	1.13*	1.08*	0.49**	0.60**
	(0.65)	(0.60)	(0.58)	(0.57)	(0.23)	(0.24)
$DEBT_{t-1}$		0.068*	0.061	0.071*	0.071*	0.070
		(0.036)	(0.037)	(0.036)	(0.040)	(0.041)
$INTEREST_{t-1}$		-0.099	-0.21	-0.22	0.29	0.14
		(0.66)	(0.81)	(0.79)	(1.14)	(1.09)
$UNEMP_{t-1}$			-0.18	-0.30	-0.22	-0.26
			(0.28)	(0.27)	(0.28)	(0.27)
$GDP\ GROWTH_{t-1}$			0.60***	0.50**	0.38**	0.35**
			(0.16)	(0.19)	(0.16)	(0.15)
$INFLATION_{t-1}$			-0.025	-0.097	-0.16	-0.18
			(0.30)	(0.34)	(0.39)	(0.37)
$OPEN_{t-1}$				0.049**	0.051**	0.052***
				(0.018)	(0.020)	(0.017)
POP_{t-1}				-0.17**	-0.15*	-0.13
				(0.071)	(0.087)	(0.084)
$EDUCATION_{t-1}$					0.78	0.77
					(1.13)	(1.09)
CPI_{t-1}						0.97*
						(0.52)
Observations	207	207	207	207	198	198
R-squared	0.331	0.366	0.433	0.460	0.476	0.492
Number of countries	23	23	23	23	22	22

Notes: The table reports regression coefficients and (in brackets) the associated robust standard errors with FE estimator. The constant, a set of time dummies and of country dummies are included in the estimations but not reported in the table. The values of *EDUCATION* are not available for Iceland (columns 5 and 6). *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Table III – Overall financial balance, government polarization and economic literacy

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
			Dep. Var.: OVERALL FINANCIAL BALANCE (% GDP)			
$LITERACY_{t-1}$	-0.13	-0.064	-0.12	-0.13	0.52	0.49
	(0.71)	(0.71)	(0.72)	(0.72)	(0.54)	(0.51)
$POLARIZATION_{t-1}$	-5.48*	-5.31*	-5.15*	-4.93*	-2.16*	-2.78**
	(3.12)	(2.95)	(2.84)	(2.77)	(1.21)	(1.26)
$(POLARIZATION*LITERACY)_{t-1}$	1.08*	1.07*	1.05*	1.02*	0.44*	0.55**
	(0.63)	(0.60)	(0.58)	(0.57)	(0.24)	(0.25)
$DEBT_{t-1}$		0.044	0.040	0.050	0.050	0.049
		(0.041)	(0.040)	(0.038)	(0.043)	(0.042)
$INTEREST_{t-1}$		-0.12	-0.28	-0.30	0.079	-0.082
		(0.67)	(0.78)	(0.76)	(1.15)	(1.10)
$UNEMP_{t-1}$			-0.29	-0.39	-0.32	-0.37
			(0.26)	(0.27)	(0.28)	(0.28)
$GDP\ GROWTH_{t-1}$			0.65***	0.56***	0.46***	0.43***
			(0.14)	(0.17)	(0.16)	(0.15)
$INFLATION_{t-1}$			-0.00016	-0.053	-0.13	-0.16
			(0.30)	(0.33)	(0.38)	(0.36)
$OPEN_{t-1}$				0.041**	0.043**	0.044**
				(0.017)	(0.020)	(0.018)
POP_{t-1}				-0.21***	-0.19**	-0.16*
				(0.071)	(0.088)	(0.084)
$EDUCATION_{t-1}$					0.69	0.68
					(1.07)	(1.03)
CPI_{t-1}						1.00**
						(0.47)
Observations	207	207	207	207	198	198
R-squared	0.299	0.314	0.403	0.433	0.434	0.453
Number of countries	23	23	23	23	22	22

Notes: The table reports regression coefficients and (in brackets) the associated robust standard errors with FE estimator. The constant, a set of time dummies and of country dummies are included in the estimations but not reported in the table. The values of *EDUCATION* are not available for Iceland (columns 5 and 6). *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Table IV – Total outlays, tax and non-tax receipts, government polarization and economic literacy

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	TOTAL OUTLAYS (% GDP)			TOTAL TAX & NON-TAX RECEIPTS (% GDP)		
$LITERACY_{t-1}$	0.053	-0.44	-0.43	-0.072	0.077	0.065
	(0.76)	(0.46)	(0.46)	(0.29)	(0.28)	(0.25)
$POLARIZATION_{t-1}$	3.71	0.72	1.06	-1.22	-1.44*	-1.72**
	(3.05)	(1.08)	(1.12)	(0.77)	(0.76)	(0.63)
$(POLARIZATION*LITERACY)_{t-1}$	-0.74	-0.11	-0.17	0.27*	0.33**	0.38***
	(0.61)	(0.21)	(0.22)	(0.14)	(0.15)	(0.13)
$DEBT_{t-1}$	-0.023	-0.011	-0.010	0.027	0.039***	0.039***
	(0.036)	(0.037)	(0.037)	(0.022)	(0.013)	(0.012)
$INTEREST_{t-1}$	1.02*	1.51*	1.60**	0.72	1.59***	1.52***
	(0.56)	(0.79)	(0.76)	(0.57)	(0.48)	(0.47)
$UNEMP_{t-1}$	0.23	0.25	0.28	-0.16	-0.071	-0.092
	(0.20)	(0.22)	(0.22)	(0.16)	(0.11)	(0.11)
$GDP\ GROWTH_{t-1}$	-0.43***	-0.42***	-0.40***	0.13	0.040	0.028
	(0.12)	(0.14)	(0.13)	(0.17)	(0.11)	(0.11)
$INFLATION_{t-1}$	0.046	0.11	0.12	-0.0071	-0.023	-0.036
	(0.25)	(0.30)	(0.29)	(0.20)	(0.19)	(0.19)
$OPEN_{t-1}$	-0.088***	-0.084**	-0.084***	-0.047**	-0.041**	-0.041**
	(0.026)	(0.031)	(0.030)	(0.022)	(0.018)	(0.019)
POP_{t-1}	0.11*	0.20**	0.18*	-0.092**	0.012	0.024
	(0.062)	(0.092)	(0.095)	(0.035)	(0.042)	(0.041)
$EDUCATION_{t-1}$		1.87	1.87		2.56***	2.56***
		(1.25)	(1.25)		(0.78)	(0.76)
CPI_{t-1}			-0.54			0.46
			(0.45)			(0.32)
Observations	207	198	198	207	198	198
R-squared	0.397	0.444	0.451	0.285	0.449	0.460
Number of countries	23	22	22	23	22	22

Notes: The table reports regression coefficients and (in brackets) the associated robust standard errors with FE estimator. The dependent variable is: total outlays over GDP for columns from (1) to (3); total tax and non-tax receipts over GDP for columns from (4) to (6).The constant, a set of time dummies and of country dummies are included in the estimations but not reported in the table. The values of *EDUCATION* are not available for Iceland (columns 2, 3 5 and 6). *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Table V – Primary balance, partisan government polarization and economic literacy

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
			Dep. Var.: PRIMARY BALANCE (% GDP)			
LITERACY$_{t-1}$	-0.15	-0.055	-0.058	-0.073	0.49	0.47
	(0.69)	(0.69)	(0.65)	(0.67)	(0.60)	(0.57)
RIGHT POLARIZATION$_{t-1}$	-7.43**	-8.27**	-7.15**	-6.96**	-3.78**	-4.54***
	(2.95)	(3.31)	(3.21)	(3.11)	(1.49)	(1.60)
(RIGHT POLARIZATION*LITERACY)$_{t-1}$	1.35**	1.55**	1.34**	1.32**	0.64*	0.78**
	(0.60)	(0.66)	(0.62)	(0.61)	(0.32)	(0.32)
LEFT POLARIZATION$_{t-1}$	-2.15	-1.40	-1.88	-2.28	-0.65	-1.03
	(2.35)	(2.59)	(2.79)	(2.85)	(2.67)	(2.67)
(LEFT POLARIZATION*LITERACY)$_{t-1}$	0.39	0.34	0.40	0.51	0.18	0.24
	(0.50)	(0.57)	(0.62)	(0.64)	(0.60)	(0.61)
CENTER POLARIZATION$_{t-1}$	0.95	-1.41	-1.63	-3.11	-1.45	-2.14
	(3.29)	(3.65)	(3.54)	(3.51)	(3.18)	(3.27)
(CENTER POLARIZATION*LITERACY)$_{t-1}$	-0.075	0.35	0.40	0.53	0.20	0.31
	(0.61)	(0.68)	(0.66)	(0.67)	(0.57)	(0.61)
DEBT$_{t-1}$		0.091**	0.084**	0.095***	0.080**	0.080**
		(0.034)	(0.035)	(0.031)	(0.035)	(0.036)
INTEREST$_{t-1}$		-0.21	-0.28	-0.23	0.27	0.11
		(0.70)	(0.83)	(0.82)	(1.20)	(1.15)
UNEMP$_{t-1}$			-0.23	-0.31	-0.21	-0.25
			(0.29)	(0.27)	(0.27)	(0.27)
GDP GROWTH$_{t-1}$			0.43***	0.32*	0.31	0.28
			(0.14)	(0.17)	(0.20)	(0.19)
INFLATION$_{t-1}$			-0.088	-0.16	-0.16	-0.18
			(0.30)	(0.33)	(0.39)	(0.37)
OPEN$_{t-1}$				0.054**	0.052**	0.052**
				(0.021)	(0.024)	(0.020)
POP$_{t-1}$				-0.22***	-0.19**	-0.17*
				(0.056)	(0.090)	(0.086)
EDUCATION$_{t-1}$					0.43	0.38
					(1.33)	(1.27)
CPI$_{t-1}$						1.04*
						(0.53)
Observations	207	207	207	207	198	198
R-squared	0.344	0.400	0.437	0.470	0.485	0.504
Number of countries	23	23	23	23	22	22

Notes: The table reports regression coefficients and (in brackets) the associated robust standard errors with FE estimator. The constant, a set of time dummies and of country dummies are included in the estimations but not reported in the table. The values of *EDUCATION* are not available for Iceland (columns 5 and 6). *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Table VI – Overall financial balance, partisan government polarization and economic literacy

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
			Dep. Var.: OVERALL FINANCIAL BALANCE (% GDP)			
$LITERACY_{t-1}$	0.0068	0.077	0.081	0.051	0.60	0.57
	(0.71)	(0.72)	(0.66)	(0.68)	(0.61)	(0.59)
$RIGHT\ POLARIZATION_{t-1}$	-7.14**	-7.74**	-6.61*	-6.41**	-3.38**	-4.17**
	(3.03)	(3.37)	(3.24)	(3.09)	(1.58)	(1.75)
$(RIGHT\ POLARIZATION*LITERACY)_{t-1}$	1.33**	1.46**	1.25*	1.24**	0.59*	0.73**
	(0.60)	(0.66)	(0.61)	(0.59)	(0.33)	(0.35)
$LEFT\ POLARIZATION_{t-1}$	-1.53	-0.99	-1.55	-1.91	-0.32	-0.71
	(2.43)	(2.65)	(2.88)	(2.92)	(2.74)	(2.75)
$(LEFT\ POLARIZATION*LITERACY)_{t-1}$	0.30	0.27	0.33	0.44	0.12	0.19
	(0.51)	(0.57)	(0.63)	(0.65)	(0.61)	(0.62)
$CENTER\ POLARIZATION_{t-1}$	0.22	-1.46	-1.45	-3.29	-1.81	-2.53
	(3.26)	(3.59)	(3.47)	(3.48)	(3.37)	(3.47)
$(CENTER\ POLARIZATION*LITERACY)_{t-1}$	0.029	0.34	0.35	0.53	0.24	0.35
	(0.59)	(0.65)	(0.63)	(0.66)	(0.60)	(0.64)
$DEBT_{t-1}$		0.066	0.061	0.074**	0.060	0.059
		(0.040)	(0.039)	(0.034)	(0.038)	(0.037)
$INTEREST_{t-1}$		-0.20	-0.33	-0.28	0.089	-0.079
		(0.72)	(0.82)	(0.81)	(1.26)	(1.21)
$UNEMP_{t-1}$			-0.33	-0.40	-0.31	-0.35
			(0.28)	(0.27)	(0.28)	(0.27)
$GDP\ GROWTH_{t-1}$			0.48***	0.39**	0.39*	0.35*
			(0.13)	(0.16)	(0.20)	(0.19)
$INFLATION_{t-1}$			-0.067	-0.12	-0.13	-0.16
			(0.29)	(0.32)	(0.39)	(0.37)
$OPEN_{t-1}$				0.045**	0.044*	0.044**
				(0.021)	(0.025)	(0.021)
POP_{t-1}				-0.26***	-0.24**	-0.22**
				(0.054)	(0.091)	(0.086)
$EDUCATION_{t-1}$					0.22	0.17
					(1.30)	(1.23)
CPI_{t-1}						1.08**
						(0.46)
Observations	207	207	207	207	198	198
R-squared	0.318	0.350	0.405	0.444	0.444	0.466
Number of countries	23	23	23	23	22	22

Notes: The table reports regression coefficients and (in brackets) the associated robust standard errors with FE estimator. The constant, a set of time dummies and of country dummies are included in the estimations but not reported in the table. The values of *EDUCATION* are not available for Iceland (columns 5 and 6). *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Appendix A

In this appendix we solve problem (9) and derive equations (14) and (15).

Lemma

The consumption of private goods is a γ-fraction of the consumption of public goods:

$$c_j = \gamma g_j \qquad (A1)$$

Proof

By contradiction. Use (13) in program (9) and compute the f.o.cs for t_j and g_j:

$$\frac{1+\gamma}{\gamma} \frac{d \, min[c_j, \gamma g_j]}{dt_j}\left(1+\frac{\rho}{\bar{z}}\right) + [T - t_j + g_j - \eta_j]\left(1 + \frac{\rho}{\bar{z}} + \rho\frac{1-\sigma}{\bar{z}}\frac{\mu}{\beta_t}\right) = 0 \qquad (A2)$$

$$\frac{1+\gamma}{\gamma} \frac{d \, min[c_j, \gamma g_j]}{dg_j}\left(1+\frac{\rho}{\bar{z}}\right) - [T - t_j + g_j - \eta_j]\left(1 + \frac{\rho}{\bar{z}} - \rho\frac{1-\sigma}{\bar{z}}\frac{1-\mu}{\beta_g}\right) = 0 \qquad (A3)$$

We now show that if we start by assuming that $c_j > \gamma g_j$ we end up with the contradictory conclusion that $c_j < \gamma g_j$. In fact, if $c_j > \gamma g_j$, the derivative $d \, min[c_j, \gamma g_j]/dt_j$ is nil and, due to (A2), it holds $T - t_j + g_j - \eta_j = 0$. However, because of (A3), the latter implies that the derivative $d \, min[c_j, \gamma g_j]/dg_j$ is also nil, i.e. that $c_j < \gamma g_j$.

Analogously, if we start by assuming $c_j < \gamma g_j$ we end up with the contradictory conclusion that $c_j > \gamma g_j$. This proves the lemma.

Solution

Equation (A1) allows us to restate program (9) only in terms of the control variable t_j:

$$V(c_j, g_j, s_j) = \frac{1+\gamma}{\gamma} \cdot (y - t_j) - \frac{1}{2}[T - s_j]^2 \qquad (A4)$$

$$s_j = t_j - g_j + \eta_j = -\frac{y}{\gamma} + \frac{1+\gamma}{\gamma}t_j + \eta_j \qquad (A5)$$

$$E(\eta_j | t_j, g_j) \equiv \mu\frac{t_j - \alpha_t}{\beta_t} + (1-\mu)\frac{g_j - \alpha_g}{\beta_g} = \frac{t_j - \alpha_t}{\beta_t} \equiv E(\eta_j | t_j) \qquad (A6)$$

Notice that equation (A6) suggests that μ is immaterial for the solution. The reason is that (A1) and the conjectured policy - equations (12) in the main text – imply the following restriction as for the unknown coefficients:

$$\alpha_g = \frac{1}{\gamma}y - \frac{1}{\gamma}\alpha_t \qquad\qquad \beta_g = -\frac{1}{\gamma}\beta_t \qquad (A7)$$

Use (A4)-(A6) in program (9) and compute the f.o.c. with respect to t_j:

$$\left[-1 + \left(T + \frac{y}{\gamma} - \frac{1+\gamma}{\gamma}t_j - \eta_j\right)\right]\frac{1+\gamma}{\gamma}\left(1 + \frac{\rho}{\bar{z}}\right) + \rho\frac{1-\sigma}{\bar{z}}\left(T + \frac{y}{\gamma} - \frac{1+\gamma}{\gamma}t_j - \eta_j\right)\frac{1}{\beta_t} = 0 \qquad (A8)$$

Notice that this expression requires $-\frac{1+\gamma}{\gamma}t_j - \eta_j$ to be independent from η_j. For this to be the case, it must hold

$$\beta_t = -\frac{\gamma}{1+\gamma} \qquad\qquad (A9)$$

Substitute (A9) in (A8) and solve with respect to t_j:

$$t_j = \frac{\gamma}{1+\gamma}\left(T - 1 + \frac{y}{\gamma} - \eta_j\right) - \frac{\gamma}{1+\gamma}\frac{\rho(1-\sigma)}{\bar{z}+\sigma\rho} \qquad (A10)$$

Finally, substitute (A10) in (A1) and solve for g_j:

$$g_j = \frac{1}{1+\gamma}\left(-T + 1 + y + \eta_j\right) + \frac{1}{1+\gamma}\frac{\rho(1-\sigma)}{\bar{z}+\sigma\rho} \qquad (A11)$$

Equations (A10) and (A11) correspond to equations (14) and (15) in the main text.

Appendix B

Table B.I – Cyclically-adjusted primary balance, government polarization and economic literacy

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. Var.: CYCLICALLY-ADJUSTED PRIMARY BALANCE (% potential GDP)					
$LITERACY_{t-1}$	-0.68	-0.63	-0.70	-0.68	0.10	0.080
	(0.76)	(0.68)	(0.73)	(0.73)	(0.47)	(0.43)
$POLARIZATION_{t-1}$	-6.86*	-6.86**	-6.48*	-6.28*	-2.91***	-3.46***
	(3.44)	(3.14)	(3.18)	(3.12)	(0.92)	(0.98)
$(POLARIZATION*LITERACY)_{t-1}$	1.36*	1.38**	1.32*	1.28*	0.58***	0.68***
	(0.70)	(0.64)	(0.66)	(0.65)	(0.19)	(0.20)
$DEBT_{t-1}$		0.055*	0.043	0.049	0.036	0.035
		(0.028)	(0.032)	(0.032)	(0.033)	(0.035)
$INTEREST_{t-1}$		0.23	0.31	0.29	1.26	1.12
		(0.65)	(0.81)	(0.79)	(0.85)	(0.80)
$UNEMP_{t-1}$			0.096	0.0026	0.17	0.13
			(0.31)	(0.31)	(0.27)	(0.27)
$GDP\ GROWTH_{t-1}$			0.33**	0.25	0.18	0.16
			(0.14)	(0.17)	(0.14)	(0.13)
$INFLATION_{t-1}$			-0.13	-0.19	-0.20	-0.23
			(0.27)	(0.29)	(0.35)	(0.33)
$OPEN_{t-1}$				0.040*	0.036	0.036*
				(0.021)	(0.022)	(0.019)
POP_{t-1}				-0.10	-0.075	-0.051
				(0.089)	(0.10)	(0.10)
$EDUCATION_{t-1}$					1.21	1.20
					(1.41)	(1.39)
CPI_{t-1}						0.90*
						(0.51)
Observations	207	207	207	207	198	198
R-squared	0.346	0.372	0.398	0.414	0.432	0.448
Number of countries	23	23	23	23	22	22

Notes: The table reports regression coefficients and (in brackets) the associated robust standard errors with FE estimator. The constant, a set of time dummies and of country dummies are included in the estimations but not reported in the table. The values of *EDUCATION* are not available for Iceland (columns 5 and 6). *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Table B.II – Cyclically-adjusted overall balance, government polarization and economic literacy

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. Var.: CYCLICALLY-ADJUSTED OVERALL BALANCE (% potential GDP)
$LITERACY_{t-1}$	-0.53	-0.51	-0.57	-0.56	0.17	0.15
	(0.69)	(0.66)	(0.70)	(0.70)	(0.46)	(0.43)
$POLARIZATION_{t-1}$	-6.14*	-6.20**	-5.90*	-5.74*	-2.63**	-3.22***
	(3.14)	(2.98)	(3.00)	(2.95)	(0.96)	(1.05)
$(POLARIZATION*LITERACY)_{t-1}$	1.24*	1.25*	1.21*	1.18*	0.54**	0.64***
	(0.64)	(0.61)	(0.61)	(0.61)	(0.20)	(0.22)
$DEBT_{t-1}$		0.027	0.018	0.024	0.015	0.013
		(0.030)	(0.032)	(0.033)	(0.034)	(0.034)
$INTEREST_{t-1}$		0.21	0.22	0.21	0.99	0.84
		(0.59)	(0.73)	(0.71)	(0.83)	(0.78)
$UNEMP_{t-1}$			-0.0041	-0.085	0.058	0.015
			(0.29)	(0.29)	(0.27)	(0.26)
$GDP\ GROWTH_{t-1}$			0.38***	0.31*	0.24*	0.22*
			(0.13)	(0.16)	(0.14)	(0.13)
$INFLATION_{t-1}$			-0.084	-0.13	-0.16	-0.19
			(0.27)	(0.29)	(0.35)	(0.33)
$OPEN_{t-1}$				0.032	0.029	0.030
				(0.021)	(0.023)	(0.021)
POP_{t-1}				-0.13	-0.10	-0.076
				(0.086)	(0.10)	(0.10)
$EDUCATION_{t-1}$					1.12	1.11
					(1.33)	(1.30)
CPI_{t-1}						0.94*
						(0.46)
Observations	207	207	207	207	198	198
R-squared	0.270	0.279	0.314	0.332	0.308	0.331
Number of countries	23	23	23	23	22	22

Notes: The table reports regression coefficients and (in brackets) the associated robust standard errors with FE estimator. The constant, a set of time dummies and of country dummies are included in the estimations but not reported in the table. The values of *EDUCATION* are not available for Iceland (columns 5 and 6). $*p < 0.10$; $**p < 0.05$; $***p < 0.01$.

Table B.III – Primary balance, government polarization and education

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. Var.: PRIMARY BALANCE (% GDP)					
$EDUCATION_{t-1}$	-0.21	0.15	0.78	-0.20	-0.27	0.66
	(1.30)	(1.37)	(1.22)	(1.01)	(1.02)	(1.09)
$POLARIZATION_{t-1}$	0.55	0.081	-0.42	-1.07	-1.60	-1.54
	(3.47)	(3.21)	(3.32)	(3.21)	(3.15)	(3.04)
$(POLARIZATION*EDUCATION)_{t-1}$	-0.027	0.0025	0.030	0.059	0.082	0.080
	(0.17)	(0.16)	(0.16)	(0.16)	(0.16)	(0.15)
$DEBT_{t-1}$		0.068*	0.053	0.068*	0.067	0.068
		(0.035)	(0.040)	(0.040)	(0.041)	(0.040)
$INTEREST_{t-1}$		0.41	0.47	0.27	0.13	0.091
		(1.01)	(1.17)	(1.15)	(1.12)	(1.07)
$UNEMP_{t-1}$			-0.031	-0.21	-0.25	-0.23
			(0.26)	(0.29)	(0.28)	(0.27)
$GDP\ GROWTH_{t-1}$			0.53***	0.37**	0.35**	0.36**
			(0.14)	(0.17)	(0.16)	(0.16)
$INFLATION_{t-1}$			-0.11	-0.20	-0.22	-0.19
			(0.34)	(0.39)	(0.38)	(0.38)
$OPEN_{t-1}$				0.051**	0.052***	0.055***
				(0.020)	(0.018)	(0.018)
POP_{t-1}				-0.20**	-0.18**	-0.13
				(0.084)	(0.083)	(0.083)
CPI_{t-1}					0.80*	0.85
					(0.45)	(0.50)
$LITERACY_{t-1}$						0.78
						(0.47)
Observations	198	198	198	198	198	198
R-squared	0.305	0.354	0.409	0.451	0.462	0.479
Number of countries	22	22	22	22	22	22

Notes: The table reports regression coefficients and (in brackets) the associated robust standard errors with FE estimator. The constant, a set of time dummies and of country dummies are included in the estimations but not reported in the table. The values of *EDUCATION* are not available for Iceland. *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Table B.IV – The falsification test: randomization of LITERACY

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. Var.: PRIMARY BALANCE (% GDP)					
$LITERACY_{t-1}$	-0.26	-0.28	-0.22	-0.18	-0.086	-0.12
	(0.43)	(0.41)	(0.41)	(0.39)	(0.40)	(0.41)
$POLARIZATION_{t-1}$	-0.52	-1.04	-1.14	-0.93	-0.014	0.058
	(1.47)	(1.50)	(1.38)	(1.39)	(1.29)	(1.35)
$(POLARIZATION*LITERACY)_{t-1}$	0.11	0.21	0.23	0.22	0.035	0.017
	(0.30)	(0.30)	(0.28)	(0.28)	(0.26)	(0.27)
$DEBT_{t-1}$		0.049	0.035	0.046	0.066	0.065
		(0.040)	(0.040)	(0.039)	(0.040)	(0.041)
$INTEREST_{t-1}$		0.25	0.24	0.24	0.32	0.19
		(0.61)	(0.72)	(0.71)	(1.15)	(1.12)
$UNEMP_{t-1}$			-0.027	-0.16	-0.22	-0.25
			(0.24)	(0.25)	(0.29)	(0.29)
$GDP\ GROWTH_{t-1}$			0.60***	0.50***	0.36**	0.34**
			(0.13)	(0.17)	(0.16)	(0.15)
$INFLATION_{t-1}$			-0.10	-0.17	-0.22	-0.24
			(0.32)	(0.37)	(0.42)	(0.40)
$OPEN_{t-1}$				0.048**	0.052**	0.052**
				(0.020)	(0.022)	(0.020)
POP_{t-1}				-0.20***	-0.20**	-0.18**
				(0.065)	(0.088)	(0.086)
$EDUCATION_{t-1}$					-0.20	-0.25
					(1.04)	(1.05)
CPI_{t-1}						0.77
						(0.48)
Observations	206	206	206	206	198	198
R-squared	0.302	0.326	0.412	0.450	0.451	0.461
Number of countries	23	23	23	23	22	22

Notes: The table reports regression coefficients and (in brackets) the associated robust standard errors with FE estimator. The constant, a set of time dummies and of country dummies are included in the estimations but not reported in the table. The values of *EDUCATION* are not available for Iceland (columns 5 and 6). *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Table B.V – Unobservable variables: first test by Chetty et al. (2014a, 2014b)

	Predicted PRIMARY BALANCE
LITERACY	0.0412
POLARIZATION	-0.077
*LITERACY*POLARIZATION*	-0.0595

Notes: Predicted PRIMARY BALANCE is the predicted value of a series of yearly OLS regressions where the dependent variable is the general government primary balance over GDP and the regressors are the: i) the interaction between country size (i.e. land area in squared kilometers; source: the World Bank – Food and Agriculture Organization) – as proxy of fiscal decentralization (Panizza 1999) – and political stability, that is an overall indicator about perceptions of destabilization or overthrowing of the government in power (source: the World Bank – Governance Indicators); and ii) ethnic fractionalization (Alesina et al. 2003). We report the pairwise correlations between *Predicted PRIMARY BALANCE* and our main independent variables (*LITERACY, POLARIZATION* and their interaction) included in our main model. *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Table B.VI – Unobservable variables: second test by Chetty et al. (2014a, 2014b)

VARIABLES	(1) Dep. Var.: *Predicted PRIMARY BALANCE*	(2) Dep. Var.: *PRIMARY BALANCE*
LITERACY$_{t-1}$	-0.099	-0.19
	(0.063)	(0.68)
POLARIZATION$_{t-1}$	-0.35	-5.37*
	(0.26)	(2.71)
*(POLARIZATION*LITERACY)$_{t-1}$*	0.069	1.08*
	(0.054)	(0.56)
DEBT$_{t-1}$	-0.00039	0.062
	(0.0034)	(0.036)
INTEREST$_{t-1}$	0.080	-0.26
	(0.11)	(0.79)
UNEMP$_{t-1}$	0.017	-0.19
	(0.038)	(0.27)
GDP GROWTH$_{t-1}$	0.073**	0.55***
	(0.032)	(0.16)
INFLATION$_{t-1}$	0.049	-0.058
	(0.050)	(0.30)
Predicted PRIMARY BALANCE		0.67*
		(0.35)
Observations	207	207
R-squared	23	23
Number of countries	0.909	0.445

Notes: The dependent variables are the predicted primary balance over GDP in column (1), and the primary balance over GDP in column (2). Time dummies are included in the estimates (coefficients are omitted in the table). Estimates are derived from FE regressions with standard errors robust to heteroscedasticity. All regressions are estimated with an intercept term. Standard errors in round brackets. *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.