

Schooling, Political Participation, and the Economy*

Filipe R. Campante[†] Davin Chor[‡]

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Abstract

We investigate how the link between individual schooling and political participation is affected by country characteristics. Using individual survey data, we find that political participation is more responsive to schooling in land-abundant countries, and less responsive in human capital-abundant countries, even while controlling for country political institutions and cultural attitudes. We also find related evidence that political participation is less responsive to schooling in countries with a higher skill premium, suggesting that these patterns are influenced by the opportunity cost of engaging one's human capital in political rather than production activities. We therefore propose an explanation that centers on an allocation decision that individuals face over the use of their human capital. A relative abundance of land (used primarily in the least skill-intensive sector) or a scarcity of aggregate human capital will increase both the level of political participation and its responsiveness to schooling, by lowering the opportunity cost of production income foregone. In an extension, we show how this framework can provide a joint explanation for patterns of political participation at the individual level and differences in public investment in education at the country level.

Keywords: Education; Human capital; Political participation; Voting; Factor endowments; Skill Premium; Culture; State provision of schooling

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[†]Harvard Kennedy School, Harvard University. Address: 79 JFK Street, Cambridge, MA 02138, USA. Email: filipe_campante@harvard.edu (Corresponding author)

[‡]School of Economics, Singapore Management University. Address: 90 Stamford Road, Singapore 178903. E-mail: davinchor@smu.edu.sg

1 Introduction

The relationship between schooling and human capital on the one hand and political participation on the other has been one of the most widely studied topics in political science and political economy. It is now well established that more educated citizens display a greater propensity to engage in virtually all forms of political activity, including voting, attending political events, staying informed about politics, working on campaigns, contributing money, and signing petitions.¹ As a result, education has even been labeled “the best individual-level predictor of political participation” (Putnam 1995a, p.68). Building on this, there is also a large body of evidence suggesting that this micro-level relationship extends to the macro level, as education and democracy are positively correlated at the cross-country level.² Since political participation can be viewed as a set of activities aimed at influencing or imposing checks and balances on the government, this aggregate relationship would appear to be a natural consequence of that which is so clearly observed at the individual level.

There is nevertheless considerable variation across countries in this link between schooling and political participation (Verba et al. 1987). To give an oft-used example, there is a stark contrast in how politically active citizens of Latin American and East Asian countries are perceived to be: While Latin America is often seen as “a region of unusual political phenomena. . . with its military coups, riots, demonstrations, and frequent unscheduled changes of governments” (Wynia 1978, p.23), East Asian societies have been broadly characterized as ones where “[h]armony and cooperation were preferred over disagreement and competition” and where “the conflict of ideas, groups, and parties was viewed as dangerous and illegitimate” (Huntington 1991, p.24).³ This presents an obvious puzzle, since it is the East Asian countries that have generally achieved higher levels of human capital accumulation over the last half-century.⁴ At first blush, this appears at odds with the strong positive correlation between individual schooling and political participation found within countries.

This paper argues that understanding this cross-country variation requires that we examine how several pertinent country characteristics affect the intensity of the link between individual schooling and political participation. Much of this discussion has to date centered on such country variables as political institutions and cultural mores to explain the cross-country differences in the extent of citizens’ political

¹Recent empirical work in this vein includes: Verba and Nie (1987), Rosenstone and Hansen (1993), Putnam (1995b), Bénabou (2000), Dee (2004), Freeman (2004), Milligan et al. (2004), and Glaeser et al. (2007).

²The hypothesis that education leads to a more democratic polity is of a fairly old vintage (Dewey 1916, Lipset 1959). That said, the issue of causality and the mechanisms that generate this relationship continue to be actively debated; see Glaeser et al. (2004), Acemoglu et al. (2005), Glaeser et al. (2007), Bobba and Coviello (2007), and Castelló-Climent (2008).

³While Verba et al.’s (1987) seven-nation comparison did not cover Latin America, it is interesting that they found the link between “socioeconomic resources” (such as education) and political participation to be weakest in the one East Asian society (Japan) in their study.

⁴These perceptions find broad support in the data: In the World Value Survey (WVS), the mean score for Latin American respondents was 0.62 on a scale of 0-2 when asked about their propensity to participate in lawful demonstrations (question E027), compared with a mean score of 0.51 in East Asian countries. On the other hand, the average total years of schooling in the population aged 15 and above in East Asia was 8.0 in the year 2000, exceeding the average in Latin America (6.7) by more than a year (Barro and Lee 2000; calculated for the set of countries in the WVS).

participation. We nevertheless argue that this is not the full picture. We start from the recognition that even as human capital promotes political participation, it also plays a more basic economic role as a factor input in production processes. Our understanding of how schooling affects political engagement will thus be incomplete if we ignore the production role of human capital.

With this motivation in mind, we focus on a set of economic variables that naturally affects the productivity of human capital in production activities, namely a country’s factor endowment mix. We use detailed respondent data from the World Values Survey (WVS) and the Comparative Study of Electoral Systems (CSES) on various forms of political participation, such as discussing politics, attending lawful demonstrations, and voting. Our primary goal is to uncover how country characteristics systematically influence the micro-level relationship between schooling and political participation. To this end, we pursue an empirical strategy that regresses these measures of participation against the interaction of individual schooling and country variables, while controlling for respondent schooling and a comprehensive set of other individual attributes, as well as country-survey wave fixed effects.

The data in fact reveal a robust empirical connection involving country factor endowments and the link between schooling and political participation at the individual level. Our key findings are summarized in Figure 1, which contains partial scatterplots of a measure of the responsiveness of political participation to schooling within each country derived from the WVS, illustrated with respect to several country variables.⁵ Panel A of the figure depicts a clear upward-sloping relationship, indicating that individual political participation tends to be more responsive to increases in schooling in countries with a greater per worker land endowment. On the other hand, Panel C shows that a higher initial skill endowment tends instead to dampen the link between participation and schooling. (We find no distinct relationship with physical capital in Panel B.) Of note, we find a complementary role for cultural attitudes in shaping patterns of political participation (Panel D): Countries that bear more favorable attitudes towards obedience tend to exhibit a weaker link between individual schooling and political involvement. Additionally, we find the above effects to be much weaker when using a measure of voting from the CSES instead, as compared to the more active forms of political participation surveyed in the WVS, a result which we discuss in more detail later (Section 3.1.3).

[FIGURE 1 HERE]

We propose an interpretation for these findings that is based on the interplay between the production and political roles of human capital. A key premise here is the idea that political participation requires the use of human capital. For individual citizens, it has indeed been argued that “political activities have

⁵Specifically, we use the first principal component of five self-reported measures of political participation from the WVS, as listed in Section 2.2. This is first regressed against individual education and other respondent traits, including age, gender, and income decile, separately for each country-wave (see Table 1 for the full list of individual controls); we use the regression coefficient on individual education as our measure of the responsiveness of political participation to schooling for each country-wave. We then regressed these education coefficients against the full set of country variables from the Table 1, Column (5) specification, to obtain these partial scatterplots.

considerable costs [and] require the commitment of time and energy, often in considerable amount” (Verba and Nie 1987, p.34), whether this be for attending political events or simply gathering news on political developments. Importantly, for the economy as a whole, large amounts of human capital are clearly devoted to political activities in the work of politicians, lobbyists, and volunteers.⁶ Given these dual roles of human capital, allocating more effort towards political participation therefore entails an opportunity cost to the representative individual, in terms of foregone production income. Intuitively then, in a country where production is skewed away from skill-intensive sectors (due to a relative abundance of specific factors used outside the skill-intensive sectors, such as arable land), an individual will have less incentive to use her human capital in production, and thus have a lower opportunity cost of applying her human capital towards political activities instead.

We present some supplementary evidence to support this explanation of our central findings. First, we find that a higher country skill premium is associated with a weaker link between schooling and political participation, and that the effect of factor endowments appears to operate through its effect on the skill premium (Section 3.2.2). This is consistent with our basic intuition to the extent that the skill premium proxies for the income foregone from engaging human capital in political rather than production activities. Second, we obtain similar results with an alternative measure of the resource intensity of the economy, based on the share of natural resources in total exports (Section 3.2.3). Countries with a higher level of food and agricultural raw materials exports exhibit a stronger link between schooling and political participation, consistent with the view that these are economies in which production activities are less intensive in their use of human capital.

To formalize these ideas, we proceed to sketch a simple model. In our model, citizens trade off the benefit of increased political participation, which is needed to contest the power of the government to tax or expropriate, against the cost of production income foregone. Thus, any socioeconomic or political force that makes the use of human capital in the production sector relatively more enticing will tend to decrease the effort that is channeled to political participation. This model delivers predictions that match the stylized facts from the data: A greater abundance of the factor used intensively in the least skill-intensive sector (in particular, a larger endowment of arable land for the agricultural sector) will raise the responsiveness of each citizen’s level of political participation to an increase in schooling, while a greater abundance of the factor used in the most skill-intensive sector will have the opposite effect.

Interestingly, this simple framework can be extended to shed light on the question of why some governing regimes (but not others) have invested so heavily on education, as illustrated by the contrast in average years of schooling attainment in East Asia and Latin America.⁷ We show that a greater endowment of the factor used specifically in the least skill-intensive sector will be associated *ceteris*

⁶Using Brady et al.’s (1995) terminology, political activity takes up three types of resources: time, civic skills, and money. The first two are directly related to human capital, and money is often used to buy the use of other people’s human capital.

⁷For example, see Lee and Kim (1997) on South Korea, Birdsall et al. (1996) and Brown (2002) on Brazil, and Ratliff (2003) for a more general comparison.

paribus with more political participation. In such countries, this will lead a self-interested ruler to invest less in human capital in order to soften the checks and constraints she might otherwise face from the citizenry.⁸ We provide some cross-country evidence that is suggestive of this pattern: Countries initially well-endowed with arable land relative to labor indeed witnessed smaller subsequent increases in average years of schooling between 1975-2000. Crucially, this effect is strongest in countries that were not fully democratic, where our political economy explanation is likely more applicable, but weakens considerably for democracies. This argument is moreover *prima facie* consistent with the initial endowment conditions in the motivating East Asia versus Latin America example: In East Asia, with its comparative advantage in production activities that are skill-intensive (due to its relative scarcity in natural resources such as land), individuals are less inclined to channel their energies towards political activities, in contrast to more resource- and land-abundant Latin America. East Asian governments thus rationally chose to raise state provision of education to achieve output growth, as the underlying endowment mix meant that the accompanying increase in political activism would be modest. This framework thus offers a joint explanation for patterns of political participation at the individual level and differences in public investment in education at the country level.

In terms of related work, our paper follows a growing literature on how initial conditions have influenced long-run country development. This work has identified how initial land and resource abundance (Engerman and Sokoloff 1997, Acemoglu et al. 2002, Naritomi et al. 2007) and the initial disease environment (Acemoglu et al. 2007, 2008) help to explain the variance in institutional structures observed today, both across and within countries. Similarly, Leamer et al. (1999) argue that initial factor endowments were a root cause of the high income inequality observed in present-day Latin America. Our argument also contributes to a body of work on the political economy of education provision by ruling elites, including Bourguignon and Verdier (2000), Galor and Moav (2006), De la Croix and Doepke (2008), Galiani et al. (2008), Galor et al. (2009), and Zhang (2008). On a broader note, it echoes recent calls for research in the economics of education to recognize that governments view human capital as more than just an input to production and are indeed sensitive to the sociopolitical implications of expanding education (Pritchett 2003).

In what follows, we describe our empirical strategy in Section 2. Section 3 presents our central empirical results based on the WVS and CSES data, and investigates our proposed interpretation. Section 4 formalizes this intuition in a simple model. Section 5 extends the framework to consider the issue of state provision of schooling, and presents some suggestive cross-country evidence consistent with our predictions here. Section 6 concludes.

⁸Incidentally, this offers a potential explanation for the turnout puzzle, namely why voter turnout has decreased historically in the US and other democracies, even as education levels were increasing (Brody 1978) – what Aldrich (1993) called “the most important substantive problem in the turnout literature”. One possible reason could be the onset of skill-biased technological change, which has made human capital relatively more valuable in production activities.

2 Uncovering the Role of Country Characteristics: Empirical Strategy

2.1 Empirical Model of Individual Political Participation

Our main question of interest is how key country characteristics systematically influence the well-known relationship between an individual’s level of schooling and her propensity to engage in political activities. The natural starting point for this inquiry is the extensive literature on the relationship between schooling and political participation. Prior empirical studies in this literature have typically used micro-level survey data for a given country and run regression specifications of the form:

$$PolPart_i = \beta_1 V_i + \beta_2 Educ_i + \varepsilon_i \quad (1)$$

where i indexes individuals. $PolPart_i$ is a self-reported measure of political participation, and this is regressed against the respondents’ education level ($Educ_i$) and a vector of other individual controls (V_i), such as age and gender; ε_i is a standard iid error term. The robust finding here has been a positive and highly significant β_2 coefficient, for a diverse range of political participation measures.

To uncover the role of country characteristics, we bring together micro-level data on individual political participation on the one hand, and macro-level data on country attributes on the other. We ultimately want to check whether there are interaction effects of individual education with country characteristics on measures of political participation, using pooled datasets of country surveys. We thus work with specifications of the form:

$$PolPart_{ict} = \beta_1 V_i + \beta_2 Educ_i + \beta_3 Educ_i \times W_{ct} + D_{ct} + \eta_c + \varepsilon_{ict} \quad (2)$$

where c denotes country and t denotes time. In addition to the individual attributes (V_i and $Educ_i$), (2) includes interaction terms between individual education and a vector of country characteristics of interest ($Educ_i \times W_{ct}$), as explanatory variables for participation ($PolPart_{ict}$). The key parameter of interest here is the coefficient vector, β_3 , since this captures how country attributes (W_{ct}) alter the responsiveness of political participation to education at the individual level. Note that we affix a time index on the country variables, since the datasets we use feature multiple surveys for the same country conducted in different years.⁹ The inclusion of a full set of country-survey wave fixed effects (D_{ct}) allows us to control for all country- or time-specific variables that might uniformly affect levels of participation within each country and survey wave. We also cluster our standard errors by country, to accommodate correlated but unobservable shocks to political behavior within countries that might be relatively stable across time. This is reflected in the η_c error term in (2); the ε_{ict} ’s are standard iid noise.¹⁰

⁹We do not index the individual attributes, V_i and $Educ_i$ by time, since we do not observe the same individual more than once in the pooled datasets. (The surveys are not a longitudinal panel).

¹⁰This empirical strategy is similar to Solt (2008), who interacts measures of individual income against country income inequality, in order to examine whether country inequality differentially impacts the political engagement of individuals in different income brackets. However, Solt (2008) uses a random country effects rather than a fixed effects specification.

One clear advantage of this empirical strategy is that it maximizes the use of the available data, namely all the individual observations across countries and survey waves in the WVS and CSES, as detailed below. Nevertheless, it is important to bear in mind that the estimation of β_3 , which captures how the coefficient of education differs systematically across countries, ultimately relies on the cross-country variation in the country characteristics (W_{ct}) that are interacted with individual education.

2.2 Data

Our primary source of individual data on political participation is the World Values Survey (WVS), a rich study of sociocultural attitudes around the world. There are four available waves of the WVS (conducted in 1981-1984, 1989-1993, 1994-1999, and 1999-2004), but our regression analysis draws only on Waves 2-4 because the set of variables is considerably more limited in Wave 1. There are also other constraints, since the survey waves do not constitute a balanced panel. That said, this still leaves us with a large number of observations from 47 countries, with representation from all major continents. (Appendix Table 1 summarizes the country coverage in our eventual regression sample.)

Given the multifaceted nature of political participation, we consider a range of measures for our dependent variable, $PolPart_{ict}$. We draw these measures from the following categorical response questions asked in the WVS (where necessary, we have recoded the responses so that higher values reflect more active participation):

1. *Interest in politics* (question E023): “How interested would you say you are in politics?”
0=Not at all interested, 1=Not very interested, 2=Somewhat interested, 3=Very interested
2. *Importance of politics* (question A004): “For each of the following aspects, indicate how important it is in your life. Politics.”
0=Not at all important, 1=Not very important, 2=Rather important, 3=Very important
3. *Discuss politics* (question A062): “When you get together with your friends, would you say you discuss political matters frequently, occasionally or never?”
0=Never, 1=Occasionally, 2=Frequently
4. *Petition* (question E025): “Now I’d like you to look at this card. I’m going to read out some different forms of political action that people can take, and I’d like you to tell me, for each one, whether you have actually done any of these things, whether you might do it or would never, under any circumstances, do it. Signing a petition.”
0=Would never do, 1=Might do, 2=Have done
5. *Demonstrate* (question E027): Same question as for *Petition*, now referring to “Attending lawful demonstrations.”
0=Would never do, 1=Might do, 2=Have done

The first two measures can be viewed as “soft” measures of participation, which relate more to interest in and attitudes towards politics. These stand in contrast to the two “hard” measures (*Demonstrate* and *Petition*) of political action. While the “soft” measures capture political activities that are not as publicly visible, we nevertheless view them as informative of the time and effort that individuals routinely put in to stay informed of political developments and government policies. We view the third measure (*Discuss politics*) as standing somewhere between the two poles, as it captures a form of political action that is less widely visible. Overall, this spectrum of diverse variables provides a more comprehensive body of evidence than if we had focused exclusively on any single measure of participation.¹¹

Some readers might be missing a discussion of voting, a measure of political participation that has traditionally been used in this line of research. Our second source of survey data – the Comparative Study of Electoral Systems (CSES) – supplements the empirical analysis with information on voting, since the WVS does not ask a direct question on respondents’ voting history.¹² The CSES is a collaborative cross-country project that undertakes surveys in the aftermath of national elections, typically within one year. As with the WVS, local researchers take the lead in collecting the survey data, employing statistical sampling methods to ensure a respondent pool that is representative of the electorate. Two modules of data are available (Module 1 for elections from 1996-2002, Module 2 for 2001-2006). Pooling the data from the two modules gives us data from 42 legislative or presidential elections in 25 countries. Our variable of interest is a binary variable for whether the respondent voted in the election in question, and we use this as another *PolPart_{ict}* measure in logit regressions based on the specification in (2). It should be noted though that the country coverage here is more limited, given the shorter history of the CSES project: The sample consists mostly of European and North American countries, with no post-election surveys from Africa included yet.

Turning to the explanatory variables, we use each respondent’s self-reported highest education level attained as a measure of *Educ_i*. This is coded on a categorical scale that ranges from a low of 1 (‘Inadequately completed elementary education’) to a high of 8 (‘University with degree/Higher education - upper-level tertiary certificate’). The WVS also contains a rich set of respondent characteristics – including age, gender, marital status, number of children, student status, employment status, and income decile – which we use in our vector of controls, V_i , in the regressions. The CSES also includes respondent education, which is reported on a 1-8 categorical scale comparable to the WVS, as well as a set of other individual controls that is similar to the WVS.

¹¹The WVS contains questions on participation in boycotts (question E026), unofficial strikes (E028), and occupation of buildings or factories (E029). When these variables were included, the results with the first principal component of the participation measures are similar to what we see in Table 1. However, used individually as dependent variables, the results work less well. This is likely because these latter three measures are more extreme forms of political participation that elicit more ‘no participation’ responses, hence resulting in less observed variance. Moreover, these arguably speak less directly to political action; for example, the question on strikes and occupying buildings could relate more to labor relations.

¹²The WVS does include a question asking respondents which party they would vote for if an election were held tomorrow, to which one of the response options is: ‘I would not vote’. This is however an indirect question on voting intentions, and is a noisy measure of whether respondents would actually bear the pecuniary and non-pecuniary costs of going to the polls to translate their intentions into action.

This individual survey data from the WVS and CSES is merged with several country-level variables (W_{ct}). As we have discussed in the Introduction, we are particularly interested in each country’s factor endowments, namely their per worker arable land, physical capital, and human capital stocks. We denote these as T/L , K/L , and H/L , respectively. We also use variables such as real GDP per capita, population, Gini coefficient, and democracy, which serve as controls. These variables are all derived from standard sources in the macro literature, and the details on their construction can be found in the Data Appendix. In the results we report, we use 5-year lagged averages for all country variables for each survey wave/module. The results are broadly similar if contemporaneous explanatory variables are used (results available on request). For descriptive statistics for all the variables, please see Appendix Tables 2 and 3 for the WVS and CSES respectively.

One final country variable of interest that requires some further discussion is related to the “values” or “culture” hypothesis, which has gained some prominence as an alternative explanation for cross-country differences in observed political activism. This view, popularly termed the “Confucian values” or “Asian values” debate, suggests that the unique cultural heritage of East Asia places an emphasis on education, as well as on values such as “placing order and harmony over personal freedom, [and] respecting political leadership” (Milner 2000, p.57). To account for these differences, we focus on the role of attitudes toward obedience. In particular, we base our measure of such attitudes on the following WVS question (the responses have been recoded to be increasing in obedience):

- *Obedience in the workplace* (question C061): “People have different ideas about following instructions at work. Some say that one should follow one’s superior’s instructions even when one does not fully agree with them. Others say that one should follow one’s superior’s instructions only when one is convinced that they are right. With which of these two opinions do you agree?”
0=Must be convinced first, 1=Depends, 2=Follow instructions

We take the mean response by country-survey wave to this question as an indicator of how willing citizens are to accept and defer to external sources of authority, and hence as a proxy for the cultural preferences of citizens for political consensus rather than open disagreement.

3 Schooling, Political Participation and Country Characteristics: What the Data Say

3.1 Evidence

We now present our empirical findings on the determinants of individual political participation and the role of country characteristics. We start by employing a principal components analysis, to summarize the information contained in the five WVS measures of political participation. Table 1 reports the results from OLS regressions for the WVS dataset, using the first principal component of the five participation

measures as the dependent variable, $PolPart_{ict}$. (Table 2 will later report results for each of the separate participation measures.)

[TABLE 1 HERE]

Column (1) presents a baseline regression which includes only individual-level variables, and country-survey wave fixed effects; this is equivalent to (2) with W_{ct} as a null vector. This serves as a point of comparison with the existing empirical literature, corroborating the standard result that political participation is indeed increasing in schooling for our pooled country sample. Of note, this effect is significant despite our controlling for the income decile of the respondent, so education itself does have explanatory power for patterns of political participation that is independent of income status. The effects of the other individual controls are relatively unsurprising: Older citizens are more politically active, but this effect tapers off after a certain age. Women are less politically active. There is no significant effect of marital status, but participation decreases for respondents with more children. Students are more politically active, as are employed individuals. These patterns remain very robust across all specifications, even as we subsequently introduce country characteristics as explanatory variables.¹³

3.1.1 Country Factor Endowments

Following the empirical strategy outlined in Section 2.1, we introduce the three country factor endowment measures in Column (2) by interacting them with individual education. (The level effects of these country characteristics are absorbed by the country-wave fixed effects, D_{ct} .) We find evidence in favor of a positive and significant effect on the interaction terms with $\log(T/L)$, as well as a negative effect on the interaction with $\log(H/L)$. (The positive effect of $\log(K/L)$ that shows up in Column (2) will turn out not to be robust in other specifications.) In other words, *political participation is more responsive to increases in individual schooling in countries with a higher per worker land endowment, and it is less responsive to education in countries with a high average human capital endowment.*

These patterns show up consistently, even as we subject the data to more checks. In Column (3), we exclude potential outliers, removing those countries that are more than three standard deviations away from the sample mean for any one of the three factor endowments. This drops Singapore (with a very low $\log(T/L)$) and Uganda (with a very low $\log(K/L)$), but the results are largely unaffected. Column (4) adds two new interaction terms, of education with country real GDP per capita and with country working age population. These give strong confirmation that the arable land and human capital interactions are not just picking up country wealth or size effects. On the other hand, the positive $Educ_i \times \log(K/L)$ coefficient from Columns (2)-(3) loses statistical significance when these controls are implemented.

¹³We have experimented with several additional respondent controls, namely: a full set of occupation dummies, and the size of town of residence. These did not detract from our core results (available on request), but we excluded these controls from our tables as these were available for a smaller number of countries and reduced our sample size substantially.

Column (5) adds interaction terms involving several more country attributes that *a priori* might matter for explaining patterns of political participation. These include income inequality (Gini coefficient), ethnic fractionalization (ELF), a democracy index, and a socialist dummy (for communist and former communist countries). The first two of these variables speak to the issue of potential cleavages within the polity, which could in principle affect the degree of activism among citizens. The democracy variable allows us to control for citizens' formal access to political voice. On the other hand, the socialist dummy is a means (albeit a fairly crude one) to try to capture the extent to which the institutions of schooling are used by the state for the purposes of indoctrination or socialization. (We also include an interaction with the measure of cultural attitudes on obedience, but we defer a discussion of this to the next subsection.) Reassuringly, our results in Column (5) remain broadly unchanged for the education interactions with country land and human capital endowments, with most of the auxiliary interactions exhibiting insignificant coefficients.

As a further robustness check, Column (6) includes the full set of interactions between respondent income decile and the country-wave fixed effects (namely, $Income_i \times D_{ct}$), to check that the $Educ_i \times W_{ct}$ terms are indeed picking up the effects of education rather than that of income (which tends to be highly correlated with education). Our findings with regards to the coefficient of the $Educ_i \times \log(T/L)$ interaction are robust to the use of this extensive set of controls; it however reduces the significance of the $Educ_i \times \log(H/L)$ coefficient, although the sign of the point estimate remains negative. Last but not least, Column (7) imputes the value of missing individual variables by assigning it the mean value observed within the relevant country-survey wave in the WVS, while also introducing a set of dummy variables to indicate whether the individual control in question was imputed; this follows Glaeser et al. (2005), who adopt this procedure over concerns that the missing observations in the WVS are not random omissions. We find this leaves our main conclusions intact, with the interaction between education and $\log(H/L)$ now negative and significant again at the 10% level.

Throughout all specifications, the size of the coefficients stay remarkably stable, and the effects that they identify are quantitatively non-trivial. Focusing as an example on the Column (5) specification, evaluating all other country characteristics at the sample median, an increase in land endowment ($\log(T/L)$) from the 10th to the 90th percentile country level would raise the responsiveness of political participation to education from an initial value of 0.244 to 0.327, a sizeable 34% increase. Repeating this calculation for $Educ_i \times \log(H/L)$, a similar move up the country pecking order of human capital endowment would decrease the responsiveness of participation to education by about 22%.

These conclusions based on the first principal component carry over in large measure when we examine each of the WVS political participation variables separately. The upper panel of Table 2 reports the results from OLS specifications. Since the dependent variables are categorical in nature, the lower panel performs the estimation via ordered logit regressions instead. For the sake of brevity, we report only two regressions for each measure of political participation: (i) a lean specification containing the interactions

with only the three country factor endowment variables, following Column (2) in Table 1; and (ii) a full specification with the most extensive set of controls, following Column (7) in Table 1. (A comprehensive set of specifications is available on request, but the results are similar.) Regardless of whether OLS or ordered logit is used as the estimation procedure, the findings reinforce the main message of a positive cross-derivative between education and country land endowment, and a negative cross-derivative between education and country human capital. (The results are especially strong for the coefficient on the land endowment interaction.) Note in particular that the point estimates are always of the same sign, with a single exception for the very last ordered logit regressions using *Petition*, where the $Educ_i \times \log(H/L)$ coefficient is positive but not significant.

[TABLE 2 HERE]

3.1.2 Cultural Attitudes

To address the “culture” hypothesis, we explore whether cultural attitudes towards obedience systematically affect the intensity of the relationship between schooling and political participation. To this end, we include the measure of attitudes towards obedience as an additional country characteristic interacted with individual schooling, starting with the Column (5) specification in Table 1.

The results show a significant negative coefficient on this interaction term between education and “obedience”, indicating that *in countries inclined towards such attitudes and behavior, political participation tends to be less responsive to increases in individual schooling*. Interestingly, the quantitative implications of this coefficient fall within the same order of magnitude as those from the interactions with factor endowments: The specification in Column (5) indicates that the derivative of participation with respect to schooling is about 21% lower in a country with the 90th percentile level of “Obedience” compared to the 10th percentile country. This coefficient is moreover very stable in terms of size and significance, as shown by Columns (6) and (7). Once again, Table 2 confirms these results, as can be seen in the even-numbered columns: We find a negative coefficient on the “obedience” interaction for all the participation variables, although the results are slightly weaker for the *Importance of Politics* and *Discuss Politics* measures.

In sum, the evidence indicates that cultural attitudes do play an important role in explaining the cross-country variation in the link between schooling and political participation. That said, this role is clearly complementary to, rather than in direct conflict with, that of country factor endowments, as our prior empirical results on the effect of factor endowments are robust to the inclusion of the obedience interaction.

3.1.3 Voting

No assessment of political participation would be complete without a discussion of voting, so we turn our attention next to the CSES. This is particularly interesting in our context because voting has been

viewed by political scientists as a very distinct and peculiar form of political activity. Voting has been described as “the only political act requiring relatively little initiative” (Verba and Nie 1987, p.77), as well as being the least demanding form of political activity, requiring the least in terms of civic skills (Brady et al. 1995). It is also seen by political sociologists as a “passive” activity, in contrast with the “active” forms aimed at influencing the political system (Milbrath and Goel 1977). The question then is: Will voting display the same patterns as the more active forms of participation we have previously considered with regards to the effect of country characteristics?

Given the binary nature of the voting variable, we estimate (2) via a logit regression, with the findings reported in Table 3. Column (1) confirms the basic positive correlation between education and the propensity to vote in the pooled CSES data.

[TABLE 3 HERE]

However, in contrast with what we saw for the other forms of participation, introducing the three factor endowment interactions with education in Column (2) yields a set of statistically insignificant results – the coefficient on $\log(H/L)$ is in fact now positive. That said, as a form of political participation, voting is subject to institutional idiosyncrasies that hardly affect other activities; for instance, a good number of countries have compulsory voting laws that make it a *de jure* mandatory duty of citizens. While the extent to which such laws are enforced varies across countries, it is important to control for the presence of compulsory voting in the vector W_{ct} of country characteristics, since they do influence citizens’ propensity to vote, and by extension the link between voting and education as well.¹⁴ We do this in Column (3), by including the interaction between individual education and a dummy variable for compulsory voting (variable obtained from the CSES). The results are fairly undistinguished, although the coefficient for the $Educ_i \times \log(T/L)$ term is now significant at the 10% level.

We obtain slightly stronger results in Column (4) where we also interact education with country real GDP per capita and with population size, as well as in Column (5) where we introduce the full set of education interactions that we have considered in Table 1.¹⁵ In these two columns, we also find a positive and significant effect of country physical capital on the relationship between voting and education. We obtain similar results even when we include the interactions between individual income and country-module fixed effects (Column (6)), or impute values for the missing individual variables (Column (7)). The indications that voting is qualitatively different from the other measures of political participation persist, however: We never find a negative cross-derivative effect between schooling and country human capital, nor do we find a significant effect of the interaction term with “obedience”. (It is interesting that the point estimate of this latter coefficient is positive – one might expect that obedience

¹⁴Verba et al. (1987) cite a study by Galen Irwin, who compared two elections in the Netherlands. In a 1970 election in which voting was optional, the education-turnout relationship was “moderately strong”, whereas for a 1967 election conducted under compulsory voting, the turnout was “almost equal across educational levels” (p.8).

¹⁵There are no country outliers in terms of factor endowments along the lines of the criterion used in Table 1, Column (3), given the smaller sample in the CSES.

would encourage voting, as the one form of participation often seen as a “duty”.) Instead, we find that democratic institutions tend to reinforce the positive education-voting correlation, while greater ethnic fractionalization tends to dampen this relationship.

Overall, it appears that the role of factor endowments is present, particularly that of the per worker land endowment, but this is considerably less prominent than for the other, more active forms of political participation surveyed in the WVS. In contrast, institutional features such as compulsory voting laws seem to play a relatively more important part in explaining voting patterns across countries.

3.2 A Proposed Explanation

Our key empirical findings can be summarized in the following stylized facts:

1. The link between individual schooling and political participation is *stronger* in countries that have a high arable land endowment per worker.
2. The link between individual schooling and political participation is *weaker* in countries that have a high level of human capital per worker.
3. The link between individual schooling and political participation is *weaker* in countries where cultural attitudes are more inclined towards obedience.
4. These effects are weaker for voting than for more active forms of participation.

What forces lie behind these facts, particularly facts 1 and 2? We hypothesize that the role of factor endowments is associated with the way the production structure of the economy conditions the choice of how much effort individuals would rationally devote to political activities. To articulate this intuition more precisely, the opportunity cost of the production income foregone from setting aside more effort to political participation is lower in countries where human capital is less valuable in production activities. This would be the case, for instance, when the country is land-abundant, thus leading to a production structure that is skewed towards more land- rather than skill-intensive sectors. By the same token, the opportunity cost of production income foregone is higher in skill-intensive economies, thus dampening the responsiveness of individual’s political participation to increases in schooling in such countries.

This interpretation is certainly consistent with fact 4, that the effect of factor endowments is weaker for voting than for the more active forms of participation. Given that voting has been characterized as a form of political activity that requires relatively little time or effort, and hence a relative low opportunity cost in terms of production income foregone, one would expect that the intuition highlighted above would apply less to voting. That said, we might still expect to observe some muted effects insofar as voting is positively correlated with other forms of political participation at the individual level.

In what follows, we turn to a series of additional exercises that probe the data further, in order to assess our interpretation and explanation more directly.

3.2.1 Skill Premium

While we have hitherto focused on the role of factor endowments, a quick generalization of our baseline intuition implies that any country trait that raises the opportunity cost of production income foregone should lower each citizen’s incentive to engage in political rather than production activities. In particular, one should expect this opportunity cost of political involvement to be larger in countries where the market returns to skilled labor are higher. Thus, a similar interaction term between individual education and a country measure of the labor market skill premium should be negatively correlated with political participation; in other words, a higher prevailing skill premium would dampen the effect of schooling on political participation.

A key constraint in testing this insight lies in the fact that there is limited data on the skill premium that can be consistently compared across a broad sample of countries. Subject to this limitation, we proxy for the country skill premium using data on wages for narrowly-defined occupations, as surveyed in the International Labor Organization’s (ILO) annual October Inquiry. A basic problem with the October Inquiry is that the raw data is reported in a myriad of reporting concepts (for example, average earnings versus minimum wages) that makes it difficult to compare them across countries. A significant improvement was made in standardizing this data by Freeman and Oostendorp (2001), who performed a careful data-cleaning cum econometric calibration to obtain consistent cross-country wage series. Their Occupational Wages around the World (OWW) dataset provides wage information on 161 occupations, with more than 130 countries represented between 1983-2003, although the data is very unbalanced in that countries rarely report wages for all occupations in all years.

We present evidence using two alternative measures of occupational skill. The first – Stenographer-typist in the banking industry (occupation 130) – is meant to capture the labor market returns to basic skills, namely a high-school level competency in literacy and language (Panel A). We separately consider the wages of a Computer programmer in the insurance industry (occupation 133), which reflects skills of a more advanced or technical nature (Panel B). To obtain a skill premium, we express these skilled wages relative to a baseline wage in an unskilled occupation (occupation 90: Laborers in the construction industry).¹⁶ Although the two skilled occupations notionally reflect different skilled abilities, the two skill premium measures are nevertheless positively correlated (Pearson correlation = 0.68).

[TABLE 4 HERE]

Table 4 reports these findings on the effect of the country skill premium. The regressions follow the specification in (2), with the country skill premium now included in the vector of country characteristics, W_{ct} . Column (1) reports a basic specification using the first principal component measure of political

¹⁶We have experimented with other skilled occupations in the numerator, such as stenographer-typist in other industries, accountant, and general physician. The results were all very similar, subject to the caveat that the number of observations available for these other occupations was generally smaller. The OWW also reports unskilled laborer wages in other industries, but these are all highly correlated to that in construction.

participation from the WVS as the dependent variable, with the only interaction being that between individual education and the relevant measure of the skill premium (all regressions already include individual controls, and country-wave fixed effects). We find strong evidence that political participation is less responsive to individual schooling in countries where the skill premium is higher, as indicated by the negative and significant interaction coefficients for both occupational skill measures. This coefficient consistently remains negative when we include further controls, although its significance tends to suffer due to the more limited cross-country variation as the regression sample shrinks, particularly in Panel B.

The results in Column (2), which includes the interactions between schooling and country factor endowments, are particularly interesting. Controlling for factor endowments leads to a slight fall in the magnitude of the coefficient on the skill premium interaction, which is more pronounced for the wage premium commanded by Computer programmers, where the coefficient is in fact no longer statistically significant.¹⁷ Moreover, the comparison with Table 1 (Column (2)) shows a very substantial drop in the coefficients associated with factor endowments. These smaller coefficient magnitudes are consistent with the interpretation that the effect of country factor endowments operates at least partially through its role in determining the level of the skill premium.¹⁸ (Appendix Table 4 confirms that the two skill premia measures are indeed highly correlated with factor endowments.)

Column (3) reaffirms these findings using the full specification akin to Column (7) of Table 1, which includes in particular a set of all interaction terms between individual schooling and various auxiliary country characteristics. The negative elasticity effect of the skill premium interaction remains, although it is marginally insignificant in Panel B where computer programmer wages have been used. We once again observe a decrease in the magnitude of the skill premium interaction in Column (4), where we further control for the interactions between individual education and country factor endowments.

For completeness, the final two columns in Table 4 reproduce the results using the voting data from the CSES, following the lean specification used in Columns (1) and (2) for the WVS. Although the coefficient on the skill premium interaction is for the most part negative, the significance is much weaker, which is likely a consequence of the reduced country coverage in the CSES, as well as the fact that voting is a qualitatively less active form of political engagement. (Results from specifications with more comprehensive controls are similar, and hence omitted here.)

In sum, the available data on country skill premia provides some support for the intuition that the effect of factor endowments is linked to their effect on citizens' incentives over the use of their human capital. That said, it is important to be cautious not to over-interpret this finding, particularly since the

¹⁷This finding is not an artefact of the reduced sample size: When we run the lean Column (1) specification using only those countries in the Column (2) sample, we obtain a skill premium interaction coefficient equal to -0.059 and -0.056 respectively for Panels A and B, both significant at the 1% level.

¹⁸This suggests an alternative approach, namely using the factor endowments as an instrument for the skill premium. We believe that this might stretch the limited data too far, and that the exogeneity of the endowments (particularly human and physical capital) is open to question; hence we do not include it in the tables we present. For what it is worth, we have tried this specification and the results are very much in line with the hypothesis: a negative and significant 2SLS coefficient on the skill premium at the 5% level for both skill premia (results available on request).

country overlap between the OWW and the WVS samples leaves us with a relatively small number of countries, and more so as more controls are added. We thus think of this evidence as being of a more supplementary and suggestive nature.

3.2.2 Natural Resource Exports

The logic behind our proposed explanation also implies that countries that specialize more in resource-intensive sectors such as agriculture, and hence exhibit a lower relative return to human capital, should see political participation being more responsive to increases in education at the individual level. This resource-intensiveness is most directly reflected in the factor endowment mix, but we can also measure this from a different perspective, namely using export data, on the premise that resource-intensive economies are likely to display a high volume of natural resource exports.

Table 5 explores the use of such alternative proxies for the resource-intensity of the economy. (The column specifications correspond to that in Table 4.) Specifically, we consider: (i) Food and agricultural raw materials exports; and (ii) Ores and fuel exports, where all export data are taken from the WDI, and expressed as a share of total merchandise exports for each country. Using the first principal component measure from the WVS, Columns (1)-(4) show that while ores and fuel exports have essentially no discernible effect, there is a strong positive and significant effect for the interaction with food and agricultural raw materials exports, confirming that there is a more intense link between schooling and political participation in countries that export more of these latter resources. Note from Columns (2) and (4), in particular, that including the exports measures leads to a fall in the coefficient associated with the land endowment interaction, when compared to the corresponding specification in Column (7) in Table 1. This is once again consistent with the idea that the effect of country factor endowments operates through their influence over the production (and hence export) structure of the economy. As before, the results for voting, in Columns (5)-(6), are much weaker.

[TABLE 5 HERE]

4 Making Sense of the Data: A Model of Individual Political Participation

The evidence presented in the last section collectively suggest that the stylized facts linking factor endowments, schooling, and political participation can be understood through an intuition based on the opportunity cost of engaging in political activity. We now outline a simple theoretical framework that tries to capture the basic insights of this idea. We should stress that while this is not meant to be a definitive structural model, we nevertheless find it useful for formalizing the main conceptual issues, as well as for teasing out some further interesting implications.

4.1 The Framework

Consider a representative citizen endowed with a fixed amount of human capital. This individual can choose to allocate her labor effort between different production activities, which generate direct output (tending the land, manufacturing widgets, or writing software). She also chooses how much effort to devote to political activities, which do not generate output directly, but can help protect her output from expropriation due to bad governance and rent-dissipation. She can attend political events, work for campaigns, lobby the government, write op-ed pieces, convince her neighbors, and generally keep herself informed of political developments. Due to specialization, each citizen in reality need not face these decisions on a daily basis, but the choice is clearly salient at the level of the representative individual. This modeling approach is similar to several related papers that have likewise investigated an effort-allocation problem between production and non-production or rent-seeking activities (Murphy et al. 1991, Dal Bó and Dal Bó 2009). We proceed to describe the model’s ingredients.

4.1.1 Technology and Endowments

To capture the spirit of the empirical evidence, we consider a neoclassical three-sector economy where N identical individuals are each endowed with three factors of production: T units of land, K units of physical capital, and H units of human capital. Since individuals are identical, we interpret these per worker endowments as country characteristics. Each individual allocates her human capital across three different production sectors, denoted by subscripts A (“Agriculture”), M (“Manufacturing”), and S (“Services”).

Each individual’s output, y_j , from each of the sectors, $j \in \{A, M, S\}$, is described by the following Cobb-Douglas production functions:

$$y_A = h_A^\alpha T^{1-\alpha} \quad (3)$$

$$y_M = A_M h_M^\mu K^{1-\mu} \quad (4)$$

$$y_S = A_S h_S^g S^{1-\sigma} \quad (5)$$

where h_j is the amount of human capital allocated by her to sector j , and A_M and A_S are Hicks-neutral technology parameters (that for the agricultural sector is normalized to 1). The variable (as opposed to the subscript) S is defined by $S \equiv \frac{\sum_{i=1}^N h_{Si}}{N}$, which is the aggregate amount of human capital allocated to services, expressed in per worker terms.

Note that land is specific to Sector A , whereas physical capital is specific to Sector M , a formulation that allows us to focus solely on the individual’s allocation of human capital across different activities as the key decision variable; the sector-specificity can be relaxed without detracting from the underlying intuition. In Sector S , each individual benefits from an externality generated by the average level of human capital that all individuals allocate to that sector – the more human capital others put in, the

more productive each worker will be in that sector. Our key assumption imposes a natural ranking of agriculture, manufacturing and services in their human capital intensity:

Assumption 1 $0 < \alpha < \mu < \sigma < 1$

Sector S uses human capital most intensively, followed by Sector M, and then Sector A.

4.1.2 Political Participation

We adopt a parsimonious formulation of the role of political participation. There is another agent in the model, the “government” or “ruler”, who will attempt to extract the citizens’ production income for his own private gain. The ruler’s ability to tax or expropriate can nevertheless be curtailed if citizens apply some of their labor effort towards political activities to check the executive’s power. For example, citizens could engage in public petition drives or open demonstrations. More mundanely, citizens might simply be paying close attention to policy announcements to ensure that the government does not slip unfavorable policies under their noses.¹⁹

The government succeeds in extracting a fraction $\tau(X)$ of each citizen’s production income, where $X = \sum_{i=1}^N x^i$, and x^i is the labor effort devoted by citizen i towards political participation. Note that τ can be viewed either as outright expropriation by a dictator or as more benign forms of taxation by a legitimate government (reflecting the portion of tax revenues that is not returned to citizens say in the form of public goods); our model is flexible in that it admits both interpretations.²⁰ For expositional ease, we set $\tau(X) = 1 - A_x X^{\sigma_x}$, where the constant $\sigma_x \in (0, 1)$ parameterizes the human capital intensity of political participation, and A_x is a positive constant satisfying $A_x (\sum_i H^i)^{\sigma_x} < 1$.²¹ One can view σ_x as encapsulating how features such as the pre-existing institutional landscape or prevailing cultural attitudes might affect the ability of citizens to place effective checks on the government. For instance, favorable attitudes towards obedience could mean that a given level of participation would be less constraining, corresponding to a lower σ_x .

¹⁹We focus on the role of political participation in exercising checks and balances, but this abstraction is not to deny that there are other sources of private or intrinsic benefits from political activities. For example, individuals who run for office may derive utility from the publicity (Diermeier et al. 2005). Instead, this formulation recognizes that individuals face constraints when allocating their effort between production activities that yield direct income and political activities.

²⁰We assume that the same τ applies to all three sectors. Differential risks of expropriation – for instance, one could imagine that output is easier to hide in Sector S than in M or A – could be easily captured in our framework as this is equivalent to varying the parameters A_M and A_S .

²¹More generally, our results will continue to hold if $\tau \in [0, 1]$, $\tau' < 0$ (expropriation decreases with total political participation), $\tau'' > 0$ (political participation is subject to diminishing returns), $\tau(0) = 1$ (there is full expropriation if citizens devote no effort to political participation), and the Inada-type assumption that $\tau'(0) \rightarrow -\infty$ (so that it is always optimal to allocate some effort to political participation). For Proposition 2, we will also require an additional mild assumption that the the third derivative of τ be either negative, or if positive, not too large.

4.1.3 Citizens' Decision Problem

Each individual is risk-neutral and seeks to maximize her income.²² The allocation decision facing a representative citizen with human capital H is therefore given by:

$$\max_{x, h_A, h_M, h_S} (1 - \tau(X)) \cdot (h_A^\alpha T^{1-\alpha} + p_M A_M h_M^\mu K^{1-\mu} + p_S A_S h_S^\sigma S^{1-\sigma}) \quad (6)$$

$$\text{subject to } h_A + h_M + h_S + x = H \quad (7)$$

$$\text{and } h_A, h_M, h_S, x \geq 0$$

where we have suppressed the superscript i for clarity. Here, p_M is the price of manufactured goods and p_S is the price of services (both relative to the price of agricultural output). Citizens take these prices as constants. Note also the natural assumption that individuals with more human capital H would possess more effective labor units of effort to allocate across the different production and political activities. We now solve for a symmetric Nash equilibrium where the actions of all other individuals are taken as given. In particular, each individual takes as given the aggregate stock of human capital allocated to the services sector, S , when making this allocation decision.²³

4.2 Predictions of the Model

This simple framework delivers precisely the type of relationship between factor endowments, schooling and political participation present in the data. We start by showing that the model predicts a positive correlation between human capital and political participation at the individual level, consistent with the basic stylized fact overwhelmingly established in the literature. Solving for the first-order conditions of the above maximization problem and taking comparative statics with respect to H yields:

Proposition 1 *For a given individual, an increase in her human capital will lead her to raise labor effort in all activities, namely: $\frac{dh_A}{dH}, \frac{dh_M}{dH}, \frac{dh_S}{dH} > 0$, and $\frac{dx}{dH} > 0$. In particular, it increases political participation at the individual level.*

Proof. All details of proofs are in Appendix A. ■

Not surprisingly, individuals with more human capital have more units of effective labor, and hence increase their effort allocated towards all activities including political participation. This effect is thus akin to the standard endowment effect in consumer theory; as it turns out, political participation is a “normal good”.

Having shown that there is a positive elasticity of individual political participation with respect to education, we can now derive how various country characteristics affect the magnitude of that elasticity:

²²For simplicity, we set aside the possibility of the individual obtaining direct utility from her human capital.

²³Our results hold too if we alternatively specify that citizens receive only the share of revenues that accrues to their labor effort, namely a share α , μ , or σ of the total production revenues in the respective sectors. Intuitively, this is because the share of revenues that accrues to labor is increasing in the skill-intensity of the sector.

Proposition 2 *The solution to the problem defined by (6) and (7) implies that:*

1. $\frac{d^2x}{dHdT} > 0$: *A higher per worker land endowment increases the responsiveness of an individual's political participation to her level of education;*
2. $\frac{d^2x}{dHdK}$ *ambiguous: The effect of a higher per worker physical capital endowment on the responsiveness of an individual's political participation to her level of education cannot be signed explicitly; and*
3. $\frac{d^2x}{dHdS} < 0$: *An increase in the human capital applied to the services sector by other individuals decreases the responsiveness of an individual's political participation to her level of education.*

Proposition 2 thus predicts that the magnitude of the elasticity is larger in more land-abundant countries, and smaller in human capital-abundant ones. Intuitively, when T is large, any increase to a citizen's human capital will lead to a relatively small increase in effort devoted to manufacturing or services: Individuals are less inclined to use the increased human capital in these sectors, given the abundance of land as a complementary input in agriculture. It thus becomes optimal to instead apply more of this additional human capital towards non-production activities, in order to raise the share of income that citizens retain. Put simply, a greater share of a given increase in human capital will be devoted to political activities when land is abundant, because human capital is relatively less valuable in production. Conversely, in countries where S is large, citizens will optimally allocate a relatively large part of any increase in human capital to their effort in the services sector, and the responsiveness of political participation to education thus declines. The effect of an increase in K , which is used in the sector with an intermediate skill-intensity, cannot be signed. These predictions are in line with our empirical findings, and serve to formalize the intuition we discussed then.

5 What More Can We Learn?

5.1 Factor Endowments, Political Participation, and Public Provision of Schooling

Formalizing the intuition enables us to obtain additional predictions and shed some light on possible political economy implications of the framework. In particular, we pursue an extension of the simple model from the last section to address one of the key motivating questions discussed in the introduction, namely what might lead different country governments to select different paths of human capital accumulation. Our goal here is not to provide a comprehensive model of the determinants of that accumulation or of public school provision, but rather to highlight some points where our intuition can contribute some novel insights.

As a building block, we first note that, in addition to the effects on the responsiveness of individual political participation with respect to schooling, our model also generates some implications on how factor endowments affect the level of participation. We consolidate these as:

Proposition 3 *For any given positive level of an individual’s human capital, H , we have:*

1. $\frac{dx}{dT} > 0$: *A higher per worker land endowment results in a higher level of political participation;*
2. $\frac{dx}{dK}$ *ambiguous: A higher per worker physical capital endowment has an ambiguous effect on the level of political participation;*
3. $\frac{dx}{dS} < 0$: *An increase in the human capital applied to the services sector by other individuals results in a lower level of political participation.*

The mechanisms underlying this proposition are quite intuitive, and bear clear parallels with the logic of the familiar Rybczynski Theorem from international trade. Consider a comparison between two identical countries, LA and EA , except that LA has a greater per worker land endowment, and thus a greater marginal productivity of labor in agriculture relative to the other two sectors. This leads individuals in country LA to allocate more resources to the land-intensive sector, and less to the other two, when compared to country EA . However, since agriculture is least intensive in its labor input requirements, it is not optimal to transfer this labor effort one-for-one. Instead, it is individually rational to channel some of what is freed up towards political participation, to increase the share of production income that citizens keep.²⁴ An analogous reasoning applies to the other two parts of the proposition.

It is useful to clarify how this last result relates to the stylized observation that urban dwellers tend to be more involved in politics than those in rural areas. It should be stressed that Proposition 3 does not predict that political participation would be unconditionally higher in more land-abundant countries or regions. Instead, what the model implies is that an individual in a land-abundant country/region would be more politically active than a similar individual with a comparable level of schooling in a more land-scarce country/region.²⁵

We now apply this effect of factor endowments on the level of participation to analyze the determinants of human capital provision. In other words, instead of taking the level of human capital as given, as in the baseline model of Section 4, we can consider the case of a ruler who decides at an *ex ante* stage how much education to provide to his citizens. This choice will obviously take into account the level of participation (and hence of constraints on his discretion) that the ruler can expect to be associated with that level of education in the citizenry.

This can be studied most easily in the context of a two-period extension of the model, as described by the timeline in Figure 2. We consider a self-interested ruler who controls a certain amount of resources,

²⁴Note that it is crucial for our results that there be more than one production sector, with different labor intensities. If agriculture were the only production activity in our setup, then an increase in per worker land endowment would raise labor effort in agriculture at the expense of x , and political participation would instead fall.

²⁵At first glance, the proposition may also seem at odds with Engerman and Sokoloff (1997), who attribute Latin America’s legacy of extractive ruling elites (who faced minimal checks on their power) to the set of resource and geographic endowments that predisposed these economies towards large-scale plantation agriculture manned by slave labor. However, we do not view our theory as directly applicable to this historical period, when there was a general absence of capital-intensive manufacturing industries or skill-intensive service jobs that could have acted as alternative employers of labor.

and can choose to consume them immediately or to invest in physical or human capital, taking the land endowment as given. (This is meant to capture the distinction that both forms of capital are the outcome of investment decisions, whereas the amount of land is largely constrained by natural endowments.) Both types of capital will be used in production by individual citizens in period 2, thereby increasing the production output of the economy; the ruler captures a share $\tau(X)$ of that output for his own consumption. The ruler makes his decisions in period 1, foreseeing how individuals will behave in period 2 given the endowments they receive.

[FIGURE 2 HERE]

This is clearly a very simplified case in a number of important dimensions. For one, it implies a fully nondemocratic setting that puts aside many nuances in political systems. That said, it can nevertheless help shed light on the role that initial conditions can play in influencing the incentives of governing regimes to encourage human capital accumulation. Moreover, governments typically do in practice exercise a lot of control over the quantity and quality of schooling, be it by direct provision or regulation of private schooling. In addition, it is clearly a simplified framework in that it leaves aside the role of private agents' decisions in capital accumulation; for our purposes though, this helps to put the focus on the main tradeoff between the production and political roles of human capital, from the ruler's standpoint.

In what follows, we focus on the main intuition behind our results, and defer a full-fledged description and solution of this extension to Appendix B. We solve the two-period model using backward induction. We first solve for what happens in the aggregate in our economy when the effort allocation decisions of all N individuals in Period 2 are put together, since it is aggregate political participation that determines the share of income which the ruler appropriates. It turns out that in the aggregate, citizens will set aside a certain fraction of their human capital H towards political activities, with this fraction being larger the more skill-intensive political activities are relative to production.²⁶ Taking the citizens' Period-2 behavior into account, the ruler's optimal choice regarding how much H to provide must then trade off two forces. First, we have the "political" cost of providing citizens with an extra unit of human capital: It will increase political participation, and thus reduce the share that can be captured by the ruler. On the other hand, we have the marginal benefit that stems from the additional output that is generated, part of which goes to the ruler.²⁷

As a result of that tradeoff, a crucial conclusion can be established: *Any variable that increases aggregate political participation will lead to less investment in human capital by the ruler.* So long as a variable will increase political participation in period 2, this will be sufficient to lead the ruler to pursue

²⁶This is consistent with the observation that investment in education has not always translated into greater output and faster growth, and in fact revisits the idea that this might actually be due to the relative attractiveness of production versus non-production or rent-seeking activities (North 1990, Murphy et al. 1991, Pritchett 2001).

²⁷Note that the ruler faces a type of "Laffer curve" over his ability to extract output: If he were to set the expropriation rate at its highest (by minimizing political participation through very low levels of human and physical capital), production would be very low as a result.

less human capital accumulation in period 1, even if that particular variable should also increase the productivity of human capital in production. In particular, we can conclude from our three-factor model that: *A country with a higher land endowment will invest less in human capital.*

It is worth stressing that while the connection between aggregate political participation and human capital provision in the model is very tight, this does not mean that the model implies any type of correlation between observed political participation and equilibrium levels of human capital. This is because the ruler can use his period-1 choice over H to compensate for any variables that might otherwise increase X in period 2. As a result, we need not expect any particular correlation between measures of political participation at the aggregate level and our variables of interest, such as the per worker land endowment: The latter's impact can be neutralized by the ruler's choice of human capital level. In fact, going back to our motivating comparison between East Asia and Latin America, this helps us to rationalize a situation where countries with much higher levels of education do not necessarily display higher levels of aggregate political participation.

In sum, this simple extension of our model predicts that aggregate political participation, and the underlying variables that affect it, will play a crucial role in determining the level of human capital that will be provided in a nondemocratic setting. More specifically, this extension leaves us with a specific prediction about the level of human capital accumulation across nondemocratic countries: Schooling increases should be negatively correlated with a country's initial land endowment.

5.2 Some Suggestive Evidence

We offer some suggestive evidence that the human capital accumulation experiences of countries in recent decades is consistent with the predictions of this simple model, although this is naturally subject to the data limitations faced by empirical work in any pure cross-country setting. In Table 6, we present the results of several regressions in which the dependent variable is the change in average years of schooling between 1975 and 2000, computed from the Barro-Lee (2000) data on years of education attainment in the population aged 15 and over. We examine whether: (i) the initial factor endowment attributes of the country affect future human capital accumulation paths; and whether (ii) this relationship between increases in schooling and initial factor endowments depends on the initial level of democracy. (In each regression, we also include initial years of schooling in 1975 to capture possible convergence effects in the data, but our focus is really on the other explanatory variables.)

[TABLE 6 HERE]

The initial level of democracy in 1975 (as measured on a 0-10 scale in the Polity IV dataset) and the initial land endowment do not provide much explanatory power for increases in the total years of schooling for citizens over the next quarter-century, as shown in Columns (1) and (2). The key result appears in Column (3): When we include an interaction term between initial democracy and initial $\log(T/L)$, we

find a negative and significant level effect of land abundance on future increases in schooling, as well as a positive and significant effect on the interaction term. In words, countries well endowed in land (relative to labor) witnessed smaller increases in schooling, and this effect was more pronounced for less democratic countries (with a low Polity score). We take this last point as suggestive of a political mechanism, such as that we have sketched out in our extension, being in operation.

These results are unaltered in Columns (4) and (5), where we have further controlled for the initial Log physical capital stock per worker and its interaction with Democracy respectively. We then check for robustness, by removing countries that are potential outliers in terms of their initial factor endowments.²⁸ This in fact strengthens the statistical significance of our results, as seen in Column (6); in particular, the level effect of the initial relative land endowment is now negative and significant at the 5% level. We finally investigate which component of schooling – primary, secondary, or higher (post-secondary) – might be driving our results based on total years of schooling (Columns (7)-(9)). The effects appear most significant in the regressions run with secondary and higher years of schooling (Columns (8) and (9)), consistent with the view that awareness of and interest in political activities is typically developed at these later stages of one’s education experience. Consequently, the decision to provide access to these higher levels of education is more sensitive to the initial land endowment.

In short, the data at the cross-country level suggest a link between initial factor endowments and subsequent human capital accumulation paths, and that the nature of this relationship depends on whether countries were initially democratic or non-democratic.

6 Conclusion

We have argued that the link between individual schooling and political participation is affected and conditioned by country-level variables. We have shown in the data that a higher per worker land endowment tends to strengthen the positive correlation between schooling and individual political participation, while a higher economy-wide human capital endowment tends to weaken it instead. We have also shown that cultural attitudes that favor obedience will also weaken that link. Last but not least, we have provided evidence that these effects are much less pronounced in the case of voting than for more active forms of political participation.

We have developed a simple interpretation for these findings based on the idea that country-level variables affect the relative productivity of human capital in political versus production activities. In countries where human capital is more valuable in production, individuals will be less likely to devote it to political activities, which implies a weaker link between schooling and political participation.

This interpretation is consistent with the evidence we present on how a higher skill premium is associated with a lesser impact of schooling on individual engagement with politics. Also in line with this

²⁸We define outliers as being more than three standard deviations away from the sample mean. This takes out three countries with especially low land-labor ratios (Bahrain, Kuwait and Singapore).

interpretation, we show that the natural resource-intensity of a country's exports, whose exploitation is presumably not intensive in human capital, has a similar effect to that of a greater land endowment. Finally, we have also shown how the same framework can be extended to help us understand how initial endowment conditions can affect the different paths in terms of human capital accumulation that various country governments have pursued. This can even be interpreted as yet another manifestation of the "natural resource curse": The abundance of natural resources could hinder growth by discouraging governments from investing in human capital for fear of breeding political activism, particularly in nondemocratic countries.

It should be stressed that we view our framework as in fact complementary to other explanations raised in this debate that are based on cultural values and political institutions. This is apparent from our empirical results, in which we emphasize that country-level variables of that nature (respectively, attitudes towards obedience and compulsory voting laws) are also important in understanding the individual link between schooling and political participation. Nevertheless, we believe there is promise in investigating how variables such as factor endowments or other initial conditions can help us understand how such cultural and institutional elements themselves arise and are sustained in equilibrium. We leave this line of questioning for future research.

7 References

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8 Data Appendix

Individual characteristics:

World Values Survey (WVS): All four available waves were cleaned and merged by ASEP/JDS, in collaboration with Tilburg University and Khöln Zentral Archiv. Data available at: <http://www.jdsurvey.net/jds/jdsurvey.jsp>. The various measures of political participation used are described in the main text (Section 2.2). For the key explanatory variable (education), we use question X025, which asks respondents for their highest educational level attained; the answers range from 1='Inadequately completed elementary education' to 8='University with degree/Higher education - upper-level tertiary certificate'.

Comparative Study of Electoral Systems (CSES): From <http://www.cses.org/>. Modules 1 and 2 were merged. The voting variable is based on questions A2028 in Module 1 and B3004_1 in Module 2, recoded so that 1 indicates the respondent voted at the election, and 0 that he/she did not vote. We set this variable to missing for a very small number of respondents whose answers exhibited inconsistencies, namely (i) respondents who said they did not vote but nevertheless indicated on a later question a party for which they voted; and (ii) respondents who said they voted, but did not name a party for which they voted. The education variable is from questions A2003 and B2003 in Modules 1 and 2 respectively, coded on a scale of 1-8 (ranging from 1='None' to 8='University undergraduate degree completed'; this is a largely comparable coding to that in the WVS). The indicator variable for compulsory voting is based on questions A5031 and B5037 in Modules 1 and 2 respectively. We recode these variables to equal 0 if there are no compulsory voting laws, and 1 if such laws exist.

Country-level variables:

Arable land per worker, $\log(T/L)$: From the World Development Indicators (WDI). Computed as the hectares of arable land divided by the population between ages 15-64.

Physical capital per worker, $\log(K/L)$: Physical capital stock is calculated using the perpetual inventory method, namely: $K_t = I_t + \delta K_{t-1}$, where I_t is investment and $\delta = 0.06$ is the assumed depreciation rate. The investment flow data are from the Penn World Tables, Version 6.2 (Heston et al. 2006). The initial capital stock, K_0 , is taken as $I_0/(g + \delta)$, where I_0 is the earliest value of investment available. g is the average geometric growth rate of investment in the first 10 years for which the investment data are available. Countries with less than 20 years of investment flow data are dropped, since the assumed initial value for K_0 has a larger effect when the available time series is too short. This means that only countries with investment data since 1970 are included, which in practice only drops the transition economies in Eastern Europe.

Human capital per worker, $\log(H/L)$: From Caselli (2005). Calculated as the average years of schooling in the country, weighted by the Mincerian returns to education. Specifically, $H/L = \exp(\phi(s))$, where s is the average years of schooling in the population over 25 years of age, and $\phi(\cdot)$ is a piece-wise linear function with a slope of 0.13 for $s < 4$, 0.10 for $4 < s < 8$, and 0.07 for $s > 8$. This follows Hall and Jones (1999): The first slope of 0.13 corresponds to the average Mincerian return to education observed in sub-Saharan Africa, the second slope of 0.10 corresponds to the average return for the world, while the third slope of 0.07 corresponds to the average return in the OECD.

Years of schooling: From the Barro and Lee (2000) dataset.

GDP per capita: From the WDI. Real GDP per capita in constant 2000 US dollars.

Population: From the WDI. Population between ages 15-64.

Gini coefficients: From the World Income Inequality Database (WIID), version 2.0, assembled by the World Institute of Development Economic Research (WIDER). We use the income gini coefficients (“incdefn” code equal to “Earnings, Gross”, “Income, Factor”, “Income, Gross”, “Income, Taxable”, “Market Income”, “Monetary Income, Gross”, “Earnings, Net”, “Income, Disposable”, or “Monetary Income, Disposable”). We use only those data points identified by the WIID as being of reasonably good quality (quality code equal to 1 or 2).

Democracy: From the Polity IV dataset. Democracy score, on a scale of 0 to 10. The reference date for the annual observations in the Polity IV dataset is 31 December. We match these to the data corresponding to 1 January of the following year.

Socialist: From La Porta et al. (1999). Dummy variable equal to 1 if country is of socialist legal origin.

Ethnic Fractionalization: From Alesina et al. (2003). Equal to 1 minus the Herfindahl Index of population shares of ethnic groups within a country. This is treated as a state variable that does not vary over time.

Wages: From Freeman and Oostendorp’s (2001) Occupational Wages around the World (OWW) database, which is in turn based on the International Labor Organization’s annual October Inquiry. While the OWW presents several alternative calibration procedures for standardizing the raw data, the resulting wage series are all highly correlated. To maximize the number of observations available and facilitate cross-country comparisons, we use the “x4wuus” variable in the OWW, which reports average monthly wages for male workers in current US dollars after using uniform data weights in the calibration.

Natural Resource Exports: From the WDI, in turn based on UN Comtrade data on international goods and commodity flows. The food exports measure is the sum of food and agricultural raw materials exports. The ores exports measure is the sum of mineral ores and fuel exports. Both variables are expressed as a share of each country’s total merchandize exports.

9 Appendix A: Proofs

Proof of Proposition 1

Proof. The existence of a solution to the effort-allocation problem is guaranteed by the fact that the maximand (6) is a continuous function over the compact simplex defined by (7) and the non-negativity constraints. Now, substitute $x = H - h_A - h_M - h_S$ into (6). Treating this as an unconstrained maximization problem, the first-order conditions with respect to h_A , h_M , and h_S jointly imply that:

$$\alpha h_A^{\alpha-1} T^{1-\alpha} = \mu p_M A_M h_M^{\mu-1} K^{1-\mu} = \sigma p_S A_S h_S^{\sigma-1} S^{1-\sigma}, \quad (8)$$

and also that:

$$(1 - \tau(X)) \alpha h_A^{\alpha-1} T^{1-\alpha} = -\tau'(X) \left[h_A^\alpha T^{1-\alpha} + \frac{\alpha}{\mu} h_A^{\alpha-1} T^{1-\alpha} h_M + \frac{\alpha}{\sigma} h_A^{\alpha-1} T^{1-\alpha} h_S \right],$$

This last equation can be rewritten as:

$$-\frac{1 - \tau(X)}{\tau'(X)} = \left[\frac{1}{\alpha} h_A + \frac{1}{\mu} h_M + \frac{1}{\sigma} h_S \right]. \quad (9)$$

The assumption that $\tau'(0) \rightarrow -\infty$ and the Cobb-Douglas production functions (which satisfy a similar Inada condition), ensure that the non-negativity constraints do not bind in practice, since the infinite marginal product in a neighborhood of zero guarantees that it is optimal to allocate a positive amount of effort to every activity. Thus, the first-order conditions above from the unconstrained maximization problem also pin down the solution to the constrained problem.

Differentiating (8) yields:

$$\frac{dh_A}{dH} = \frac{1 - \mu}{1 - \alpha} \frac{h_A}{h_M} \frac{dh_M}{dH} = \frac{1 - \sigma}{1 - \alpha} \frac{h_A}{h_S} \frac{dh_S}{dH}, \quad (10)$$

while differentiating (9) yields:

$$\Theta \frac{dx}{dH} = \frac{1}{\alpha} \frac{dh_A}{dH} + \frac{1}{\mu} \frac{dh_M}{dH} + \frac{1}{\sigma} \frac{dh_S}{dH}, \quad (11)$$

where $\Theta \equiv [1 + \frac{1-\tau}{\tau'} \frac{\tau''}{\tau}]$. Since $\tau' < 0$ and $\tau'' > 0$, this implies that $\Theta \geq 0$. Finally, differentiating the budget constraint (7) yields:

$$\frac{dh_A}{dH} + \frac{dh_M}{dH} + \frac{dh_S}{dH} + \frac{dx}{dH} = 1. \quad (12)$$

Based on (10), we know that $\frac{dh_A}{dH}$, $\frac{dh_M}{dH}$ and $\frac{dh_S}{dH}$ share the same sign (since $0 < \alpha, \mu, \sigma < 1$). In addition, (11) implies that $\frac{dx}{dH}$ also shares this same sign because $\Theta \geq 0$. It immediately follows from (12) that this sign has to be positive. ■

Proof of Proposition 2

Proof. Substituting (10) into (11) and (12), we obtain:

$$\frac{dx}{dH} = \frac{1}{1 + \Theta\Lambda}, \quad (13)$$

where $\Lambda \equiv \left[\frac{\frac{1}{1-\alpha}h_A + \frac{1}{1-\mu}h_M + \frac{1}{1-\sigma}h_S}{\frac{1}{\alpha}\frac{1}{1-\alpha}h_A + \frac{1}{\mu}\frac{1}{1-\mu}h_M + \frac{1}{\sigma}\frac{1}{1-\sigma}h_S} \right]$. It follows that the sign of $\frac{d^2x}{dHdT}$ depends on $\frac{d\Theta}{dT}$ and $\frac{d\Lambda}{dT}$. Our functional form assumption on $\tau(X)$ simplifies the problem as Θ is a positive constant. We can thus conclude that the sign of $\frac{d^2x}{dHdT}$ will be the opposite of the sign of $\frac{d\Lambda}{dT}$.

We proceed to obtain the sign of $\frac{d\Lambda}{dT}$. We start by noting that:

$$\begin{aligned} \frac{d\Lambda}{dT} \propto & \left[\left(\frac{1}{\mu} - \frac{1}{\alpha} \right) \frac{1}{1-\mu} h_M + \left(\frac{1}{\sigma} - \frac{1}{\alpha} \right) \frac{1}{1-\sigma} h_S \right] \frac{1}{1-\alpha} \frac{dh_A}{dT} \\ & + \left[\left(\frac{1}{\alpha} - \frac{1}{\mu} \right) \frac{1}{1-\alpha} h_A + \left(\frac{1}{\sigma} - \frac{1}{\mu} \right) \frac{1}{1-\sigma} h_S \right] \frac{1}{1-\mu} \frac{dh_M}{dT} \\ & + \left[\left(\frac{1}{\alpha} - \frac{1}{\sigma} \right) \frac{1}{1-\alpha} h_A + \left(\frac{1}{\mu} - \frac{1}{\sigma} \right) \frac{1}{1-\mu} h_M \right] \frac{1}{1-\sigma} \frac{dh_S}{dT}. \end{aligned} \quad (14)$$

where \propto denotes equality up to a positive multiplicative constant. In the proof of Proposition 3, we will show that $\frac{dh_A}{dT} > 0$, $\frac{dh_M}{dT} < 0$, and $\frac{dh_S}{dT} < 0$. Given this and the parameter assumption $0 < \alpha < \mu < \sigma < 1$, all of the terms in the expression above are negative, except for the term $\left(\frac{1}{\sigma} - \frac{1}{\mu} \right) \frac{1}{1-\sigma} h_S \frac{1}{1-\mu} \frac{dh_M}{dT}$. However, collecting the two terms involving $\left(\frac{1}{\sigma} - \frac{1}{\mu} \right)$ and using (19), we obtain:

$$\left(\frac{1}{\sigma} - \frac{1}{\mu} \right) \frac{1}{(1-\sigma)(1-\mu)} \left[h_S \frac{dh_M}{dT} - h_M \frac{dh_S}{dT} \right] = \left(\frac{1}{\sigma} - \frac{1}{\mu} \right) \frac{\mu - \sigma}{(1-\sigma)(1-\mu)} h_M \frac{dh_S}{dT} < 0. \quad (15)$$

It follows that $\frac{d\Lambda}{dT} < 0$, and hence $\frac{d^2x}{dHdT} > 0$.

A similar approach can be taken to sign the cross derivative with respect to H and S . We have an expression for $\frac{d\Lambda}{dS}$ that mirrors (14), the only difference being that T is replaced by S . The proof of Proposition 3 yields expressions for $\frac{dh_A}{dS}$, $\frac{dh_M}{dS}$, and $\frac{dh_S}{dS}$, and we plug these into the expression for $\frac{d\Lambda}{dS}$ that follows from (14). This yields:

$$\begin{aligned} \frac{d\Lambda}{dS} \propto & - \left[\left(\frac{1}{\mu} - \frac{1}{\alpha} \right) \frac{1}{1-\mu} h_M + \left(\frac{1}{\sigma} - \frac{1}{\alpha} \right) \frac{1}{1-\sigma} h_S \right] \frac{1}{1-\alpha} \frac{1}{D_S} \left(\frac{1}{\sigma} + \Theta \right) \frac{1-\sigma}{1-\alpha} \frac{h_A}{S} \\ & - \left[\left(\frac{1}{\alpha} - \frac{1}{\mu} \right) \frac{1}{1-\alpha} h_A + \left(\frac{1}{\sigma} - \frac{1}{\mu} \right) \frac{1}{1-\sigma} h_S \right] \frac{1}{1-\mu} \frac{1}{D_S} \left(\frac{1}{\sigma} + \Theta \right) \frac{1-\sigma}{1-\mu} \frac{h_M}{S} \\ & + \left[\left(\frac{1}{\alpha} - \frac{1}{\sigma} \right) \frac{1}{1-\alpha} h_A + \left(\frac{1}{\mu} - \frac{1}{\sigma} \right) \frac{1}{1-\mu} h_M \right] \frac{1}{1-\sigma} \frac{1}{D_S} \left[\left(\frac{1}{\alpha} + \Theta \right) \frac{1-\sigma}{1-\alpha} \frac{h_A}{S} + \left(\frac{1}{\mu} + \Theta \right) \frac{1-\sigma}{1-\mu} \frac{h_M}{S} \right] \end{aligned}$$

Some further simplification yields:

$$\begin{aligned} \frac{d\Lambda}{dS} \propto & - \left(\frac{1}{1-\alpha} \right)^2 \left[\left(\frac{1}{\mu} - \frac{1}{\alpha} \right) \frac{1}{1-\mu} h_M + \left(\frac{1}{\sigma} - \frac{1}{\alpha} \right) \frac{1}{1-\sigma} h_S \right] h_A \\ & - \left(\frac{1}{1-\mu} \right)^2 \left[\left(\frac{1}{\alpha} - \frac{1}{\mu} \right) \frac{1}{1-\alpha} h_A + \left(\frac{1}{\sigma} - \frac{1}{\mu} \right) \frac{1}{1-\sigma} h_S \right] h_M \\ & + \frac{1}{1-\sigma} \left[\left(\frac{1}{\alpha} - \frac{1}{\sigma} \right) \frac{1}{1-\alpha} h_A + \left(\frac{1}{\mu} - \frac{1}{\sigma} \right) \frac{1}{1-\mu} h_M \right] \left[\frac{\frac{1}{\alpha} + \Theta}{\frac{1}{\sigma} + \Theta} \frac{h_A}{1-\alpha} + \frac{\frac{1}{\mu} + \Theta}{\frac{1}{\sigma} + \Theta} \frac{h_M}{1-\mu} \right]. \end{aligned} \quad (16)$$

The terms in (16) involving $h_A h_S$ and $h_M h_S$ are all unambiguously positive. Moreover, we can collect all terms in $h_A h_M$, which are proportional (up to a positive multiplicative constant) to:

$$\begin{aligned} & \frac{1}{1-\alpha} \left(\frac{1}{\alpha} - \frac{1}{\mu} \right) - \frac{1}{1-\mu} \left(\frac{1}{\alpha} - \frac{1}{\mu} \right) + \frac{1}{1-\sigma} \left[\left(\frac{1}{\mu} - \frac{1}{\sigma} \right) \frac{\frac{1}{\alpha} + \Theta}{\frac{1}{\sigma} + \Theta} + \left(\frac{1}{\alpha} - \frac{1}{\sigma} \right) \frac{\frac{1}{\mu} + \Theta}{\frac{1}{\sigma} + \Theta} \right] \\ & > \frac{1}{1-\alpha} \left(\frac{1}{\alpha} - \frac{1}{\mu} \right) - \frac{1}{1-\mu} \left(\frac{1}{\alpha} - \frac{1}{\mu} \right) + \frac{1}{1-\sigma} \left[\left(\frac{1}{\mu} - \frac{1}{\sigma} \right) + \left(\frac{1}{\alpha} - \frac{1}{\sigma} \right) \right] \\ & > 0. \end{aligned}$$

This last inequality follows from the parameter restriction $0 < \alpha < \mu < \sigma < 1$, which in turn ensures that:

$$\frac{1}{1-\mu} \left(\frac{1}{\alpha} - \frac{1}{\mu} \right) < \frac{1}{1-\sigma} \left(\frac{1}{\alpha} - \frac{1}{\sigma} \right). \quad (17)$$

Thus, we can conclude that $\frac{d\Lambda}{dS} > 0$, from which it follows that $\frac{d^2x}{dHdS} < 0$.

We can repeat the same exercise for $\frac{d\Lambda}{dK}$. This will yield an analogous equation to (14) with T replaced by K , in which the term in $\frac{dh_A}{dK}$ is positive, but the term in $\frac{dh_S}{dK}$ is negative, and the term in $\frac{dh_M}{dK}$ is again of an ambiguous sign. It turns out that this configuration implies an ambiguous sign for $\frac{d^2x}{dHdK}$. ■

Proof of Proposition 3

Proof. Part 1. We proceed in a similar fashion to the proof of Proposition 1, to set up a system of four equations in $\frac{dh_A}{dT}$, $\frac{dh_M}{dT}$, $\frac{dh_S}{dT}$, and $\frac{dx}{dT}$. To do so, we totally differentiate (7), (8), and (9) with respect to T . The analogue of equation (10) is now:

$$\frac{dh_A}{dT} = \frac{h_A}{T} + \frac{1-\mu}{1-\alpha} \frac{h_A}{h_M} \frac{dh_M}{dT}, \quad (18)$$

$$\frac{1-\mu}{h_M} \frac{dh_M}{dT} = \frac{1-\sigma}{h_S} \frac{dh_S}{dT}. \quad (19)$$

Also, (11) remains unchanged, except that all derivatives with respect to H are replaced by derivatives with respect to T . Finally, the constraint (7) now implies:

$$\frac{dh_A}{dT} + \frac{dh_M}{dT} + \frac{dh_S}{dT} + \frac{dx}{dT} = 0. \quad (20)$$

Substituting $\frac{dx}{dT}$ from (20) into the new version of (11) yields:

$$\frac{dh_A}{dT} = \frac{1}{D_T} \left[\left(\frac{1}{\mu} + \Theta \right) \frac{1-\alpha}{1-\mu} \frac{h_M}{T} + \left(\frac{1}{\sigma} + \Theta \right) \frac{1-\alpha}{1-\sigma} \frac{h_S}{T} \right] > 0,$$

where we define $D_T \equiv \left(\frac{1}{\alpha} + \Theta \right) + \left(\frac{1}{\mu} + \Theta \right) \frac{1-\alpha}{1-\mu} \frac{h_M}{h_A} + \left(\frac{1}{\sigma} + \Theta \right) \frac{1-\alpha}{1-\sigma} \frac{h_S}{h_A}$ to keep notation simple. Substituting this into (18) in turn yields:

$$\frac{dh_M}{dT} = \frac{1}{D_T} \left[\frac{1-\alpha}{1-\mu} \frac{h_M}{h_A} \left[\left(\frac{1}{\mu} + \Theta \right) \frac{1-\alpha}{1-\mu} \frac{h_M}{T} + \left(\frac{1}{\sigma} + \Theta \right) \frac{1-\alpha}{1-\sigma} \frac{h_S}{T} \right] - D_T \frac{1-\alpha}{1-\mu} \frac{h_M}{T} \right],$$

which, with some straightforward manipulation, we can simplify as:

$$\frac{dh_M}{dT} = -\frac{1}{D_T} \frac{1-\alpha}{1-\mu} \frac{h_M}{T} \left[\frac{1}{\alpha} + \Theta \right] < 0.$$

Note that (19) now immediately implies that $\frac{dh_S}{dT} < 0$, since it must have the same sign as $\frac{dh_M}{dT}$. In fact, we have:

$$\frac{dh_S}{dT} = -\frac{1}{D_T} \frac{1-\alpha}{1-\sigma} \frac{h_S}{T} \left[\frac{1}{\alpha} + \Theta \right] < 0.$$

Now we can substitute into (20) the expressions for $\frac{dh_A}{dT}$, $\frac{dh_M}{dT}$, and $\frac{dh_S}{dT}$ that we have just obtained. This yields:

$$\frac{dx}{dT} = -\frac{1}{D_T} \left[\frac{1-\alpha}{1-\mu} \frac{h_M}{T} \left(\frac{1}{\mu} - \frac{1}{\alpha} \right) + \frac{1-\alpha}{1-\sigma} \frac{h_S}{T} \left(\frac{1}{\sigma} - \frac{1}{\alpha} \right) \right].$$

Our assumption that $0 < \alpha < \mu < \sigma < 1$ implies that $\frac{1}{\mu} - \frac{1}{\alpha} < 0$ and $\frac{1}{\sigma} - \frac{1}{\alpha} < 0$, so that $\frac{dx}{dT} > 0$.

Part 2. We proceed in an analogous fashion as in the proof of Part 1. All one has to note is that the role played by h_A in Part 1 is now played by h_M , and we should replace the parameters suitably as well; what used to be α is now μ , and vice-versa. Once this is done, it is easy to check that $\frac{dh_M}{dK} > 0$ (just as $\frac{dh_A}{dT} > 0$), $\frac{dh_A}{dK} < 0$, and $\frac{dh_S}{dK} < 0$. We can also see why the sign of $\frac{dx}{dK}$ is ambiguous: $\frac{1}{\alpha} - \frac{1}{\mu} > 0$, while $\frac{1}{\sigma} - \frac{1}{\alpha} < 0$.

Part 3. A similar proof applies, with h_S and σ replacing h_M and μ respectively, in our proof of Part 2. It immediately follows that $\frac{dh_S}{dS} > 0$, $\frac{dh_A}{dS} < 0$, and $\frac{dh_M}{dS} < 0$. Now the sign of $\frac{dx}{dS}$ is negative, since $\frac{1}{\alpha} - \frac{1}{\sigma} > 0$, and $\frac{1}{\mu} - \frac{1}{\sigma} > 0$. ■

10 Appendix B: Section 5 Extension

We present the full version of the extension of the model that is discussed in Section 5.

10.1 Solving for Aggregate Political Participation in Equilibrium

In order to solve the ruler's problem, we need first to solve for what happens in the aggregate in our economy when the decisions of all N individuals are put together. This is a necessary step, since it is aggregate political participation, $X \equiv Nx$, which determines the share of income which the ruler appropriates. To solve for the equilibrium, we impose the symmetry assumption $h_{Si} = h_S$ for all i , which in turn implies that $S = h_S$. Some straightforward algebra then yields closed-form solutions for our main endogenous variables, which we consolidate in:

Proposition 4 *Suppose $\tau(X) = 1 - A_x X^{\sigma_x}$. Then:*

$$h_A = \left(\frac{\alpha}{\sigma A_{SPS}} \right)^{\frac{1}{1-\alpha}} T \quad (21)$$

$$h_M = \left(\frac{\mu A_{MPM}}{\sigma A_{SPS}} \right)^{\frac{1}{1-\mu}} K \quad (22)$$

$$h_S = \frac{N\sigma}{\sigma_x + N\sigma} H - \frac{\sigma}{\alpha} \frac{N\alpha + \sigma_x}{N\sigma + \sigma_x} h_A - \frac{\sigma}{\mu} \frac{N\mu + \sigma_x}{N\sigma + \sigma_x} h_M \quad (23)$$

$$x = \frac{\sigma_x}{\sigma_x + N\sigma} H + \frac{(\sigma - \alpha)\sigma_x}{\alpha(N\sigma + \sigma_x)} h_A + \frac{(\sigma - \mu)\sigma_x}{\mu(N\sigma + \sigma_x)} h_M \quad (24)$$

$$X = \frac{N\sigma_x}{\sigma_x + N\sigma} \left[H + \frac{\sigma - \alpha}{\alpha} h_A + \frac{\sigma - \mu}{\mu} h_M \right] \quad (25)$$

Proof of Proposition 4

Proof. Manipulating (8) yields:

$$h_M = \left(\frac{\mu}{\alpha} A_{MPM} \right)^{\frac{1}{1-\mu}} \left(\frac{h_A}{T} \right)^{\frac{1-\alpha}{1-\mu}} K,$$

$$h_S = \left(\frac{\sigma}{\alpha} A_{SPS} \right)^{\frac{1}{1-\sigma}} \left(\frac{h_A}{T} \right)^{\frac{1-\alpha}{1-\sigma}} S.$$

Imposing symmetry ($h_S = S$) on these two equations immediately implies:

$$h_A = \left(\frac{\alpha}{\sigma A_{SPS}} \right)^{\frac{1}{1-\alpha}} T,$$

$$h_M = \left(\frac{\mu A_{MPM}}{\sigma A_{SPS}} \right)^{\frac{1}{1-\mu}} K.$$

Now we can use the functional form for $\tau(X)$, and equation (7), to obtain:

$$\begin{aligned} \frac{Nx}{\sigma_x} &= \frac{1}{\alpha} h_A + \frac{1}{\mu} h_M + \frac{1}{\sigma} h_S \\ \Rightarrow \frac{N}{\sigma_x} [H - h_S - h_A - h_M] &= \frac{1}{\alpha} h_A + \frac{1}{\mu} h_M + \frac{1}{\sigma} h_S \\ \Rightarrow h_S &= \frac{N\sigma}{\sigma_x + N\sigma} H - \frac{\sigma}{\alpha} \frac{N\alpha + \sigma_x}{N\sigma + \sigma_x} h_A - \frac{\sigma}{\mu} \frac{N\mu + \sigma_x}{N\sigma + \sigma_x} h_M \end{aligned}$$

Substituting this into (7) yields:

$$x = \frac{\sigma_x}{\sigma_x + N\sigma} H + \frac{(\sigma - \alpha)\sigma_x}{\alpha(N\sigma + \sigma_x)} h_A + \frac{(\sigma - \mu)\sigma_x}{\mu(N\sigma + \sigma_x)} h_M$$

The expression for X follows immediately from the definition $X \equiv Nx$. ■

Note that (21), (22) and (25) jointly imply that a larger endowment of any of the three factors of production (T , K , and H) unambiguously raises aggregate political participation, which stands in contrast to the comparative statics for individual participation derived in Proposition 2. The reason behind this disconnect between the individual-level versus aggregate predictions is clearly the human capital externality in the services sector.

Furthermore, from (25), out of every extra unit of human capital H that is provided, a fraction equal to $\frac{\sigma_x}{\sigma}$ will be devoted in the aggregate to political activities when $N \rightarrow \infty$.²⁹ This means that the more skill-intensive these political activities are relative to production, the more human capital the citizenry will devote to political participation in equilibrium. This is consistent with the observation that investment in education has not always translated into greater output and faster growth, and in fact revisits the idea that this might actually be due to the relative attractiveness of production versus non-production or rent-seeking activities (North 1990, Murphy et al. 1991, Pritchett 2001).

10.2 Choosing the Level of Human Capital: The Ruler's Problem

We can now return to the ruler's decision on human capital provision, following the timeline of events in Figure 2. Since we have already solved for the period 2 allocation of labor effort chosen by citizens, we focus here on the period 1 decisions made by the ruler. Suppose in period 1 that the ruler has an initial amount of resources, denoted by Z , measured in terms of the numeraire good. He can choose to consume immediately an amount C_1 of these resources, but whatever is left can be transformed into human capital, H , and/or physical capital, K , according to the production functions, $F_H(\cdot)$ and $F_K(\cdot)$. We assume these production functions are twice differentiable, increasing, and strictly concave, namely for $j \in \{H, K\}$, $F'_j(\cdot) > 0$, $F''_j(\cdot) < 0$. Both types of capital will be used in production by individual citizens in period 2, thereby increasing the production output of the economy; the ruler captures a share

²⁹Note that a necessary condition for an interior solution is $\frac{N\sigma_x}{\sigma_x + N\sigma} < 1$, which is equivalent to $\sigma_x < \frac{N}{N-1}\sigma$. When $N \rightarrow \infty$, this boils down to $\sigma_x < \sigma$. Intuitively, if political participation is more intensive in human capital than any type of production activity, the strong incentives to devote human capital to politics would lead us into a corner solution.

$\tau(X)$ of that output for his own consumption, C_2 . The ruler's problem can thus be written as:³⁰

$$\begin{aligned} \max_{H,K} \quad & C_1 + C_2 \\ \text{subject to} \quad & C_1 + F_H^{-1}(H) + F_K^{-1}(K) = Z \\ \text{and} \quad & C_2 = \tau(X) \cdot N (h_A^\alpha T^{1-\alpha} + p_M A_M h_M^\mu K^{1-\mu} + p_S A_S h_S) \\ \text{and} \quad & (21), (22), (23), (25) \\ \text{and} \quad & K, H \geq 0. \end{aligned}$$

Assuming an interior solution, the optimal amount of H and K from the ruler's standpoint must satisfy the first-order conditions:

$$\tilde{N} p_S A_S [\tau'(X)X + \tau(X)] = \frac{1}{F'_H(H)} \quad (26)$$

$$\tilde{N} p_S A_S \frac{\sigma - \mu}{\mu} \left(\frac{\mu A_M p_M}{\sigma A_S p_S} \right)^{\frac{1}{1-\mu}} [\tau'(X)X + \tau(X)] = \frac{1}{F'_K(K)}. \quad (27)$$

$$\tau'(X)X + \tau(X) = 0. \quad (28)$$

where $\tilde{N} = \frac{N^2 \sigma}{N \sigma + \sigma_x}$ is a positive constant that depends only on model parameters. The first term in square brackets in (26) and (27), $\tau'(X)X$, captures the marginal "political" cost of providing citizens with an extra unit of human capital: It will increase political participation, and thus reduce the share that can be captured by the ruler. On the other hand, the second term, $\tau(X)$, represents the marginal benefit, which stems from the additional output that is generated, part of which goes to the ruler. The marginal benefit, net of the marginal political cost, has to equal the marginal cost of factor provision, which is foregone consumption.

We now characterize how the *ex ante* choice of H , which is implicitly defined by (28), will be affected by the key variables of the model. Define $G(X) \equiv \tau'(X)X + \tau(X)$. It is easy to show, using the implicit function theorem applied to (26) and the second-order conditions of the optimization problem, that for any variable or parameter of interest j , we will have the sign of $\frac{\partial H}{\partial j}$ being equal to the sign of $\frac{\partial G}{\partial j}$. Moreover, we have:

$$\frac{\partial G}{\partial j} = [\tau''(X)X + 2\tau'(X)] \frac{\partial X}{\partial j} = (1 + \sigma_x) \tau'(X) \frac{\partial X}{\partial j}. \quad (29)$$

From this, since $\tau'(X) < 0$, it immediately follows that any variable that increases aggregate political participation will lead to less investment in human capital by the ruler. In particular:

Proposition 5 $\frac{\partial H}{\partial T} < 0$: *A country with a higher land endowment will invest less in human capital.*

Proof. Follows immediately from (29) and (25). ■

³⁰We specify the ruler's utility to be linear in his consumption, and assume away any intertemporal discount factor. It is easy to see that any concave utility function and conventional discount rate would only add to notation, without any further insight for our purposes.

Table 1
Education, Factor Endowments and Political Participation (WVS)

Dependent variable:	First Principal Component						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Education	0.166*** [0.008]	0.183*** [0.035]	0.189*** [0.036]	0.226 [0.215]	0.403* [0.199]	0.306 [0.192]	0.352* [0.185]
Education * Log(T/L)		0.021*** [0.005]	0.024*** [0.008]	0.025*** [0.008]	0.033*** [0.011]	0.028** [0.011]	0.028** [0.011]
Education * Log(K/L)		0.047*** [0.012]	0.045*** [0.012]	0.038 [0.039]	0.005 [0.033]	-0.003 [0.035]	0.018 [0.036]
Education * Log(H/L)		-0.167** [0.073]	-0.163** [0.073]	-0.165** [0.073]	-0.148** [0.060]	-0.099 [0.073]	-0.129* [0.069]
Education * Log GDPpc				0.005 [0.030]	0.019 [0.028]	0.025 [0.028]	0.011 [0.029]
Education * Log Pop				-0.003 [0.005]	0.004 [0.006]	0.001 [0.006]	0.002 [0.006]
Education * Gini					-0.002 [0.001]	-0.000 [0.001]	-0.001 [0.001]
Education * ELF Ethnic					-0.013 [0.038]	0.016 [0.039]	0.013 [0.036]
Education * Democracy					0.001 [0.003]	0.001 [0.004]	0.002 [0.004]
Education * Socialist					0.013 [0.040]	0.034 [0.037]	0.029 [0.039]
Education * Obedience					-0.123** [0.045]	-0.114*** [0.038]	-0.111** [0.046]
Age	0.042*** [0.004]	0.038*** [0.005]	0.039*** [0.005]	0.039*** [0.005]	0.045*** [0.005]	0.044*** [0.005]	0.045*** [0.005]
Age squared	-0.00035*** [0.00004]	-0.00031*** [0.00005]	-0.00033*** [0.00005]	-0.00033*** [0.00005]	-0.00039*** [0.00005]	-0.00037*** [0.00005]	-0.00038*** [0.00005]
Female? (1=Yes; 0=No)	-0.450*** [0.029]	-0.414*** [0.040]	-0.414*** [0.040]	-0.415*** [0.040]	-0.380*** [0.028]	-0.380*** [0.028]	-0.381*** [0.027]
Married? (1=Yes; 0=No)	0.017 [0.017]	-0.008 [0.021]	-0.007 [0.021]	-0.007 [0.021]	-0.000 [0.022]	-0.000 [0.022]	-0.005 [0.018]
Number of children	-0.025*** [0.006]	-0.022*** [0.007]	-0.023*** [0.007]	-0.023*** [0.007]	-0.031*** [0.008]	-0.030*** [0.008]	-0.027*** [0.007]
Student? (1=Yes; 0=No)	0.246*** [0.056]	0.245*** [0.084]	0.228** [0.085]	0.227** [0.086]	0.315*** [0.050]	0.309*** [0.049]	0.304*** [0.043]
Employed? (1=Yes; 0=No)	0.110*** [0.016]	0.112*** [0.020]	0.109*** [0.020]	0.109*** [0.020]	0.078*** [0.023]	0.076*** [0.025]	0.079*** [0.021]
Income decile	0.037*** [0.006]	0.038*** [0.009]	0.037*** [0.009]	0.037*** [0.009]	0.043*** [0.010]	0.033* [0.019]	0.044** [0.020]
Country-wave fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Excl. outlier countries?	No	No	Yes	Yes	Yes	Yes	Yes
Income * Country-wave?	No	No	No	No	No	Yes	Yes
Imputed Individual Controls?	No	No	No	No	No	No	Yes
Observations	114192	74822	72996	72996	53763	53763	64583
R-squared	0.21	0.24	0.24	0.24	0.25	0.25	0.25
No. of countries	72	47	45	45	36	36	36
No. of surveys	105	66	64	64	49	49	49

Notes: Standard errors are clustered by country, with *, **, and *** denoting significance at the 10%, 5%, and 1% levels respectively. All regressions include country-survey wave fixed effects. Columns (3)-(7) exclude outliers with factor endowment ratios that differ from the sample mean by more than three standard deviations; this drops Singapore (with a low T/L ratio) and Uganda (with a low K/L ratio). Columns (6)-(7) control for income decile interacted with country-wave dummies. Column (7) imputes missing individual-level controls with their mean value by country-survey wave, while including a set of dummy variables indicating whether each of these individual controls was originally missing (coefficients on these dummy variables not reported).

Table 2
Education, Factor Endowments and Various WVS Measures of Political Participation

Dependent variable:	Interest in Politics		Politics Important		Discuss Politics		Demonstrate		Petition	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
A: OLS										
Education	0.100*** [0.015]	0.243*** [0.079]	0.073*** [0.014]	0.202** [0.097]	0.070*** [0.015]	0.106 [0.072]	0.041** [0.018]	0.139** [0.066]	0.063*** [0.019]	0.023 [0.085]
Education * Log(T/L)	0.010*** [0.002]	0.015*** [0.005]	0.008*** [0.003]	0.009* [0.005]	0.006* [0.003]	0.009** [0.004]	0.009*** [0.003]	0.013** [0.005]	0.007 [0.004]	0.005 [0.007]
Education * Log(K/L)	0.021*** [0.006]	0.006 [0.021]	0.021*** [0.005]	0.024 [0.021]	0.008 [0.005]	0.002 [0.013]	0.024*** [0.005]	0.029** [0.012]	0.009 [0.008]	-0.015 [0.017]
Education * Log(H/L)	-0.086** [0.033]	-0.077* [0.041]	-0.090*** [0.029]	-0.099*** [0.032]	-0.032 [0.028]	-0.032 [0.025]	-0.064** [0.028]	-0.025 [0.022]	-0.03 [0.038]	-0.019 [0.032]
Education * Obedience		-0.056** [0.025]		-0.033 [0.021]		-0.027 [0.017]		-0.033** [0.013]		-0.044** [0.017]
R-squared	0.16	0.18	0.10	0.11	0.13	0.14	0.19	0.20	0.30	0.32
B: Ordered Logit										
Education	0.218*** [0.033]	0.490*** [0.174]	0.163*** [0.029]	0.415** [0.195]	0.233*** [0.050]	0.293 [0.226]	0.151*** [0.054]	0.425** [0.192]	0.114*** [0.041]	0.241 [0.208]
Education * Log(T/L)	0.020*** [0.004]	0.031*** [0.010]	0.017*** [0.005]	0.020** [0.010]	0.020* [0.011]	0.027** [0.011]	0.019* [0.010]	0.030** [0.015]	0.028** [0.012]	0.027 [0.018]
Education * Log(K/L)	0.044*** [0.012]	0.020 [0.046]	0.041*** [0.011]	0.046 [0.046]	0.025 [0.017]	-0.003 [0.043]	0.062*** [0.014]	0.051 [0.040]	0.029 [0.020]	-0.012 [0.038]
Education * Log(H/L)	-0.193*** [0.074]	-0.202** [0.081]	-0.198*** [0.060]	-0.246*** [0.068]	-0.117 [0.092]	-0.124 [0.084]	-0.202** [0.084]	-0.033 [0.072]	0.002 [0.090]	0.095 [0.070]
Education * Obedience		-0.113** [0.053]		-0.064 [0.046]		-0.089 [0.058]		-0.094* [0.048]		-0.119*** [0.043]
Pseudo R-squared	0.07	0.08	0.04	0.04	0.07	0.08	0.11	0.11	0.17	0.18
Country-wave fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Excl. outlier countries?	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Income * Country-wave?	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Imputed Individual Controls?	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	86829	71897	92856	77122	94045	77518	83263	72071	84085	72540
No. of countries	50	37	52	38	52	38	49	37	49	37
No. of surveys	69	50	75	54	76	54	70	52	71	52

Notes: Standard errors are clustered by country, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively. All regressions include: (i) individual-level controls for age, age squared, a gender dummy, a married dummy, number of children, a student dummy, an employment status dummy, and income decile; and (ii) country-survey wave fixed effects. For each dependent variable, the odd-numbered columns report a lean specification containing the interaction terms between individual education and country factor endowments, similar to Table 1, Column (2). The even-numbered columns report a full specification, similar to Table 1, Column (7). This includes further interaction terms between individual education and country characteristics (Log GDPpc, Log Pop, Gini, ELF Ethnic, Democracy, Socialist, and Obedience); excludes country outliers (SGP, UGA); includes the income by country-wave dummy controls; and applies the imputation procedure for missing individual controls.

Table 3
Education, Factor Endowments and Voting (CSES)

Dependent variable:	Vote? (1=Yes; 0=No; Logit Regressions)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Education	0.186*** [0.023]	-0.093 [0.130]	-0.144 [0.166]	0.256 [0.430]	-0.799* [0.469]	-0.753* [0.433]	-0.583 [0.428]
Education * Log(T/L)		0.038 [0.023]	0.041* [0.021]	0.039* [0.023]	0.106*** [0.024]	0.104*** [0.022]	0.109*** [0.023]
Education * Log(K/L)		0.036 [0.036]	0.041 [0.036]	0.303*** [0.077]	0.381*** [0.121]	0.264** [0.121]	0.266*** [0.095]
Education * Log(H/L)		0.200 [0.143]	0.226 [0.169]	0.235 [0.147]	0.271 [0.170]	0.235 [0.145]	0.319** [0.124]
Education * Log GDPpc				-0.191*** [0.054]	-0.282*** [0.070]	-0.239*** [0.071]	-0.240*** [0.057]
Education * Log Pop				0.019 [0.015]	0.055** [0.023]	0.060*** [0.020]	0.050*** [0.018]
Education * Gini					0.001 [0.008]	-0.002 [0.007]	-0.001 [0.006]
Education * ELF Ethnic					-0.526*** [0.189]	-0.481*** [0.161]	-0.452*** [0.136]
Education * Democracy					0.056*** [0.013]	0.068*** [0.013]	0.062*** [0.012]
Education * Socialist					0.037 [0.080]	0.006 [0.065]	0.017 [0.068]
Education * Obedience					0.262 [0.210]	0.244 [0.202]	0.203 [0.197]
Education * Compul Vote			0.039 [0.046]	0.074** [0.034]	0.452*** [0.086]	0.460*** [0.073]	0.430*** [0.069]
Age	0.083*** [0.008]	0.082*** [0.011]	0.083*** [0.011]	0.082*** [0.011]	0.077*** [0.012]	0.076*** [0.012]	0.073*** [0.010]
Age squared	-0.001*** [0.000]	-0.001*** [0.000]	-0.001*** [0.000]	-0.001*** [0.000]	-0.000*** [0.000]	-0.000*** [0.000]	-0.000*** [0.000]
Female? (1=Yes; 0=No)	-0.040 [0.041]	-0.060 [0.048]	-0.058 [0.047]	-0.054 [0.047]	-0.026 [0.048]	-0.024 [0.048]	-0.029 [0.044]
Married? (1=Yes; 0=No)	0.321*** [0.047]	0.305*** [0.051]	0.306*** [0.051]	0.307*** [0.052]	0.275*** [0.068]	0.251*** [0.069]	0.252*** [0.065]
Number of children	-0.004 [0.010]	-0.010 [0.009]	-0.009 [0.009]	-0.010 [0.009]	-0.013 [0.010]	-0.014 [0.010]	-0.015 [0.010]
Student? (1=Yes; 0=No)	0.549*** [0.107]	0.589*** [0.128]	0.588*** [0.128]	0.596*** [0.127]	0.523*** [0.137]	0.530*** [0.137]	0.470*** [0.123]
Employed? (1=Yes; 0=No)	0.122*** [0.037]	0.110*** [0.036]	0.112*** [0.036]	0.111*** [0.037]	0.130*** [0.047]	0.128*** [0.047]	0.125** [0.055]
Income quintile	0.090*** [0.016]	0.111*** [0.020]	0.111*** [0.020]	0.112*** [0.020]	0.119*** [0.022]	0.221*** [0.041]	-0.089** [0.037]
Country-Module fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Income * Country-Module?	No	No	No	No	No	Yes	Yes
Imputed Individual Controls?	No	No	No	No	No	No	Yes
Observations	76461	56978	56978	56978	38064	38064	49226
Pseudo R-squared	0.11	0.12	0.12	0.12	0.13	0.13	0.13
No. of countries	36	25	25	25	20	20	20
No. of surveys	59	42	42	42	27	27	27

Notes: Standard errors are clustered by country, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively. All regressions include country-module fixed effects. Columns (6)-(7) control for income quintile interacted with country-module dummies. Column (7) replaces missing individual-level controls with their mean value by country-module wave, while including a set of dummy variables indicating whether each of these individual controls was originally missing (coefficients on these dummy variables not reported). There were no country outliers with factor endowment ratios differing from the sample mean by more than three standard deviations.

Table 4
Education, the Skill Premium, and Political Participation

Dependent variable:	First Principal Component (WVS)				Voting (CSES)	
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	OLS	Logit	Logit
A: <u>Stenographer-typist</u>						
Education	0.200*** [0.015]	0.252*** [0.047]	0.112 [0.246]	0.126 [0.234]	0.264*** [0.051]	0.023 [0.278]
Education * Log (Skill Premium)	-0.056*** [0.013]	-0.054** [0.022]	-0.127** [0.050]	-0.113 [0.068]	0.001 [0.063]	-0.055 [0.130]
Education * Log(T/L)		0.011*** [0.004]		0.002 [0.011]		0.054 [0.046]
Education * Log(K/L)		0.017 [0.018]		0.043 [0.115]		0.008 [0.060]
Education * Log(H/L)		-0.102 [0.080]		-0.154* [0.086]		0.286* [0.151]
Education * Obedience			-0.093 [0.072]	-0.100 [0.091]		
Observations	42448	34080	31922	28629	31041	24710
R-squared or Pseudo R-squared	0.22	0.24	0.25	0.26	0.14	0.15
No. of countries	28	20	20	16	15	11
No. of surveys	38	29	26	22	24	18
B: <u>Computer Programmer</u>						
Education	0.227*** [0.015]	0.248*** [0.050]	-0.172 [0.190]	-0.544** [0.200]	0.314*** [0.078]	0.091 [0.224]
Education * Log (Skill Premium)	-0.066*** [0.015]	-0.044 [0.039]	-0.069 [0.048]	-0.056 [0.051]	-0.056 [0.066]	-0.038 [0.095]
Education * Log(T/L)		0.012 [0.007]		0.025 [0.016]		0.102*** [0.017]
Education * Log(K/L)		0.013 [0.023]		-0.117 [0.143]		0.055*** [0.016]
Education * Log(H/L)		-0.071 [0.091]		-0.275*** [0.081]		0.112 [0.102]
Education * Obedience			-0.003 [0.042]	-0.001 [0.053]		
Observations	41064	30245	27905	25619	29712	23112
R-squared or Pseudo R-squared	0.23	0.25	0.26	0.27	0.14	0.15
No. of countries	26	18	17	14	15	11
No. of surveys	38	26	23	20	23	17
Country-wave fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Excl. outlier countries?	No	No	Yes	Yes	No	No
Income * Country-wave?	No	No	Yes	Yes	No	No
Imputed Individual Controls?	No	No	Yes	Yes	No	No

Notes: Standard errors are clustered by country, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively. All regressions include: (i) individual-level controls for age, age squared, a gender dummy, a married dummy, number of children, a student dummy, an employment status dummy, and income decile/quintile; and (ii) country-survey wave fixed effects. Columns (1) and (5) report a lean specification containing the interaction terms involving individual education and the Log skill premium only. Columns (2) and (6) include the three country factor endowment interactions. Column (3) includes the interactions between individual education and auxiliary country characteristics (Log GDPpc, Log Pop, Gini, ELF Ethnic, Democracy, Socialist, and Obedience); excludes country outliers; includes the income by country-wave dummy controls; and applies the imputation procedure for missing individual controls. Column (4) further adds the country factor endowment interactions to the Column (3) specification. The CSES regressions also control for the interaction between individual education and the compulsory voting indicator.

Table 5
Education, Natural Resource Exports, and Political Participation

Dependent variable:	First Principal Component (WVS)				Voting (CSES)	
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	OLS	Logit	Logit
Education	0.140*** [0.026]	0.124** [0.048]	-0.050 [0.173]	-0.089 [0.250]	0.165** [0.068]	-0.106 [0.170]
Education * Log (Food / Total Exports)	0.015** [0.007]	0.020** [0.008]	0.032*** [0.009]	0.039*** [0.011]	0.029 [0.027]	0.006 [0.024]
Education * Log (Ores / Total Exports)	-0.003 [0.008]	-0.003 [0.007]	0.002 [0.005]	0.003 [0.006]	-0.015 [0.022]	-0.034 [0.036]
Education * Log(T/L)		0.019*** [0.005]		0.002 [0.011]		0.046** [0.019]
Education * Log(K/L)		0.053*** [0.010]		-0.004 [0.045]		0.033 [0.039]
Education * Log(H/L)		-0.179*** [0.066]		-0.158** [0.061]		0.278 [0.184]
Education * Obedience			-0.113*** [0.039]	-0.087** [0.040]		
Education * Compul Vote					0.002 [0.040]	0.057 [0.043]
Country-wave fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Excl. outlier countries?	No	No	Yes	Yes	No	No
Income * Country-wave?	No	No	Yes	Yes	No	No
Imputed Individual Controls?	No	No	Yes	Yes	No	No
Observations	93258	73856	74650	64583	72102	56978
R-squared	0.23	0.24	0.24	0.25	0.11	0.12
No. of countries	62	46	44	36	34	25
No. of surveys	85	65	58	49	56	42

Notes: Standard errors are clustered by country, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively. All regressions include: (i) individual-level controls for age, age squared, a gender dummy, a married dummy, number of children, a student dummy, an employment status dummy, and income decile/quintile; and (ii) country-survey wave fixed effects. Columns (1) and (5) report a lean specification containing the interaction terms between individual education and the two natural resource export variables. Columns (2) and (6) include the three country factor endowment interactions. Column (3) further includes the interactions between individual education and auxiliary country characteristics (Log GDPpc, Log Pop, Gini, ELF Ethnic, Democracy, Socialist, and Obedience); excludes country outliers (SGP, UGA, DOM); includes the income by country-wave dummies; and applies the imputation procedure for missing individual controls. Column (4) adds the factor endowment interactions as controls to the Column (3) specification. The CSES regressions also include the interaction between individual education and the compulsory voting indicator.

Table 6
The Cross-country Relationship between Increases in Schooling and Initial Country Factor Endowments

Dependent variable: Years of Schooling in 2000 - Years of Schooling in 1975

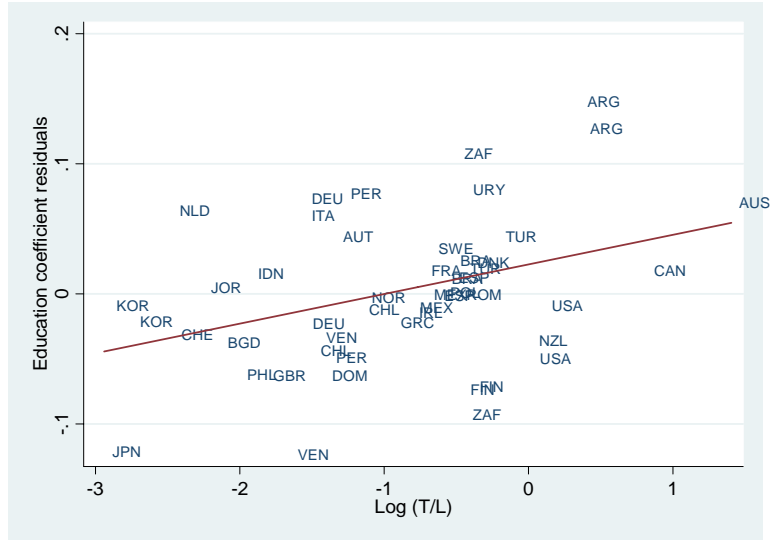
Schooling variable (in years):	(1) Total	(2) Total	(3) Total	(4) Total	(5) Total	(6) Total	(7) Primary	(8) Secondary	(9) Higher
Years of schooling, 1975	-0.007 [0.047]	-0.011 [0.048]	-0.024 [0.047]	-0.218*** [0.066]	-0.201*** [0.065]	-0.243*** [0.058]	-0.231*** [0.049]	-0.213 [0.135]	0.363** [0.180]
Democracy, 1975	0.006 [0.028]	0.009 [0.029]	0.044 [0.034]	-0.013 [0.027]	0.107** [0.041]	0.126*** [0.044]	0.080** [0.034]	0.041* [0.023]	0.004 [0.006]
Log (T/L), 1975		-0.118 [0.088]	-0.215** [0.099]	-0.065 [0.084]	-0.158 [0.097]	-0.548** [0.232]	-0.127 [0.110]	-0.315** [0.133]	-0.057** [0.027]
Democracy * Log (T/L)			0.034* [0.019]		0.037** [0.015]	0.074** [0.028]	0.023* [0.013]	0.030* [0.017]	0.008* [0.005]
Log (K/L), 1975				0.496*** [0.089]	0.580*** [0.085]	0.693*** [0.104]	0.294*** [0.073]	0.307*** [0.050]	0.059*** [0.011]
Democracy * Log (K/L)					-0.033** [0.015]	-0.035** [0.014]	-0.035*** [0.010]	-0.005 [0.011]	-0.001 [0.002]
Excl. outlier countries?	No	No	No	No	No	Yes	Yes	Yes	Yes
Observations	96	94	94	92	92	89	89	89	87
R-squared	0.00	0.03	0.05	0.24	0.32	0.35	0.39	0.38	0.54
No. of countries	96	94	94	92	92	89	89	89	87

Notes: Robust standard errors are reported, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively. The outliers dropped in Columns (6)-(9) are BHR, KWT and SGP which have an initial land-labor endowment more than three standard deviations smaller than the sample mean.

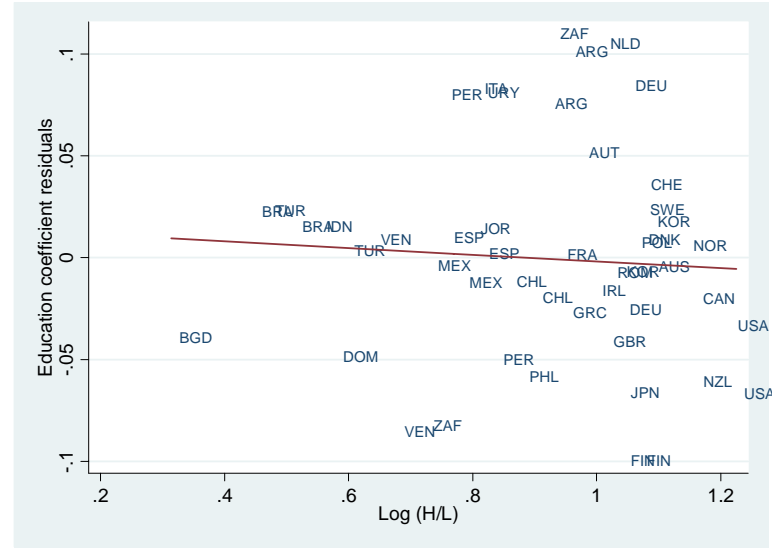
Figure 1

Partial Scatterplots of the Coefficient of Individual Education against Country Characteristics

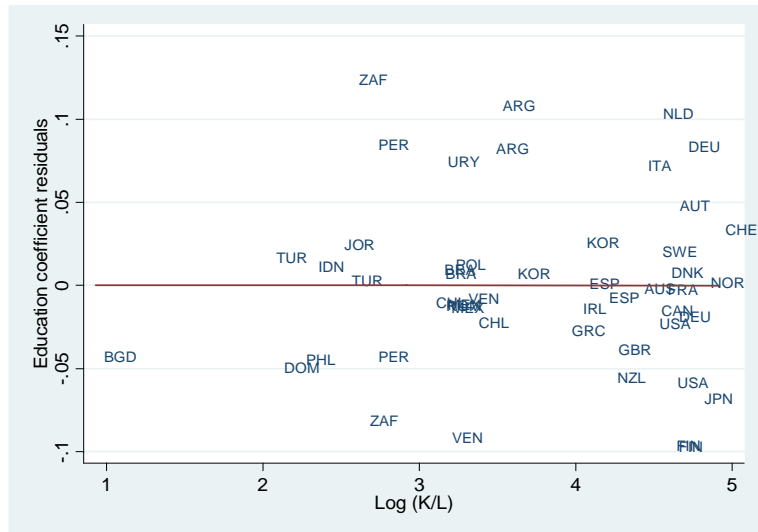
A: Arable land per worker, Log (T/L)



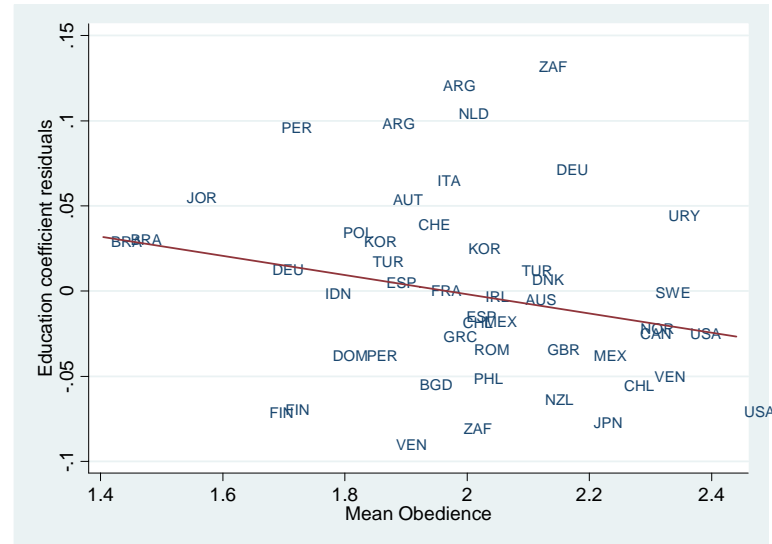
C: Human capital per worker, Log (H/L)



B: Physical capital per worker, Log (K/L)

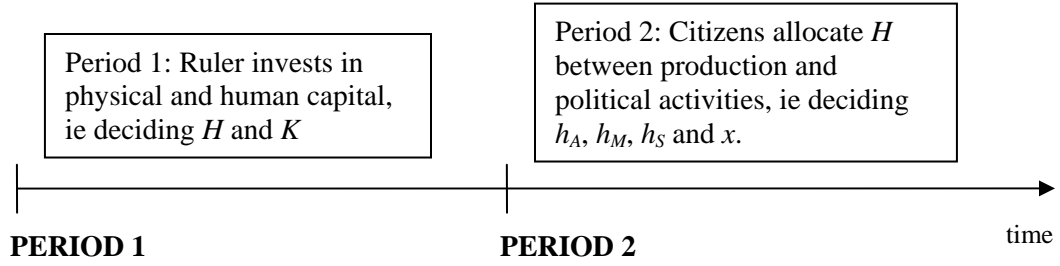


D: Obedience



Notes: We use the first principal component measure of political participation from the WVS, and first regress this against individual education and a host of other respondent controls, including age, gender, and income decile, for each country-survey separately. (See Table 1 for the full list of individual controls, V_i .) We then collect the coefficients on education from the different country-surveys and regress them against a set of country variables, to obtain these partial scatterplots for the education coefficients. (We use the full set of country variables, W_{ct} , from the Table 1, Column (5) specification.)

Figure 2
Timeline of Events



Appendix Table 1 **List of Countries in Sample**

A: World Values Survey (47 Countries, 66 surveys)

Argentina (ARG): Wave 3-4; Australia (AUS): Wave 3; Austria (AUT): Wave 4;
Bangladesh (BGD): Wave 3-4; Brazil (BRA): Wave 2-3; Canada (CAN): Wave 4;
Switzerland (CHE): Wave 2-3; Chile (CHL): Wave 3-4; Colombia (COL): Wave 3;
Germany (DEU): Wave 3-4; Denmark (DNK): Wave 4; Dominican Rep (DOM): Wave 3;
Algeria (DZA): Wave 4; Egypt (EGY): Wave 4; Spain (ESP): Wave 3-4; Finland (FIN): Wave 3-4;
France (FRA): Wave 4; United Kingdom (GBR): Wave 4; Greece (GRC): Wave 4;
Indonesia (IDN): Wave 4; India (IND): Wave 2-4; Ireland (IRL): Wave 4; Iceland (ISL): Wave 4;
Italy (ITA): Wave 4; Jordan (JOR): Wave 4; Japan (JPN): Wave 4; Korea, Rep of (KOR): Wave 3-4;
Mexico (MEX): Wave 3-4; Netherlands (NLD): Wave 4; Norway (NOR): Wave 3;
New Zealand (NZL): Wave 3; Pakistan (PAK): Wave 4; Peru (PER): Wave 3-4;
Philippines (PHL): Wave 4; Poland (POL): Wave 4; Puerto Rico (PRI): Wave 3;
Romania (ROM): Wave 3; Singapore (SGP): Wave 4; El Salvador (SLV): Wave 3;
Sweden (SWE): Wave 3; Turkey (TUR): Wave 2-4; Uganda (UGA): Wave 4;
Uruguay (URY): Wave 3; United States (USA): Wave 3-4; Venezuela (VEN): Wave 3-4;
South Africa (ZAF): Wave 2-4; Zimbabwe (ZWE): Wave 4

Notes: Tabulated for the regression sample in the specification in Table 1, Column (2), where the dependent variable is the first principal component of the five WVS political participation measures. Wave 2: 1989-1993; Wave 3: 1994-1999; Wave 4: 1999-2004.

B: Comparative Study of Electoral Systems (25 Countries, 42 surveys)

Brazil (BRA): Module 2; Canada (CAN): Module 1-2; Switzerland (CHE): Module 1-2;
Germany (DEU): Module 1-2; Spain (ESP): Module 1-2; Finland (FIN): Module 2;
France (FRA): Module 2; United Kingdom (GBR): Module 1-2; Hungary (HUN): Module 1-2;
Ireland (IRL): Module 2; Iceland (ISL): Module 1-2; Israel (ISR): Module 1-2; Japan (JPN): Module 2;
Korea, Rep of (KOR): Module 2; Mexico (MEX): Module 1-2; Netherlands (NLD): Module 1-2;
Norway (NOR): Module 1-2; New Zealand (NZL): Module 1-2; Peru (PER): Module 1;
Philippines (PHL): Module 2; Poland (POL): Module 1-2; Portugal (PRT): Module 1-2;
Romania (ROM): Module 1-2; Sweden (SWE): Module 1-2; United States (USA): Module 1-2

Notes: Tabulated for the regression sample in the specification in Table 4, Column (3), where the dependent variable is a binary variable for whether the respondent voted in the election in question. Module 1: 1996-2002; Module 2: 2001-2006.

Appendix Table 2
Summary statistics: World Values Survey

	10th	Median	90th	Mean	Std Dev
<u>Measures of political participaton</u>					
(country-survey wave means taken)					
Interest in Politics (Range: 0 to 3)	0.88	1.33	1.73	1.33	0.31
Importance of Politics (Range: 0 to 3)	0.94	1.31	1.63	1.30	0.25
Discuss Politics (Range: 0 to 2)	0.65	0.83	1.04	0.83	0.16
Demonstration (Range: 0 to 2)	0.28	0.71	1.04	0.70	0.26
Petition (Range: 0 to 2)	0.58	0.98	1.59	1.08	0.40
First Principal Component	-0.84	-0.03	0.70	-0.05	0.56
<u>Individual-level controls (WVS)</u>					
(country-survey wave means taken)					
Age	35.1	39.5	46.6	40.3	4.9
Gender (0=Male; 1=Female)	0.47	0.50	0.57	0.51	0.04
Marital Status (0=Not married; 1=Married)	0.53	0.61	0.72	0.62	0.08
Number of children	1.49	2.02	2.75	2.02	0.46
Student (0=Not Student; 1= Student)	0.03	0.07	0.15	0.08	0.05
Employed (0=Unemployed; 1=Employed)	0.45	0.55	0.67	0.56	0.09
Income decile (1=Lowest; 10=Highest)	3.2	4.7	5.7	4.6	1.0
Education (1=Lowest; 8=Highest)	3.5	4.3	5.7	4.5	0.8
<u>Country-level variables</u>					
Log(T/L)	-2.51	-1.08	0.02	-1.24	1.28
Log(K/L)	1.66	3.22	4.61	3.27	1.25
Log(H/L)	0.47	0.87	1.09	0.82	0.25
Log GDP per capita (constant 2000 US\$)	6.24	8.55	10.21	8.51	1.43
Log Population	14.78	16.85	18.34	16.70	1.49
Gini	27.85	38.49	55.49	40.15	10.58
ELF Ethnic	0.06	0.32	0.71	0.34	0.23
Democracy	2	8.2	10	7.4	3.1
Socialist (0=No; 1=Yes)	0	0	0	0.03	0.17
Obedience (0=Lowest; 2=Highest)	0.69	0.98	1.27	0.97	0.22
Log (Food and Ag raw mat / Total Exports)	1.29	2.73	3.99	2.64	1.01
Log (Ores and Fuel / Total Exports)	0.30	2.00	3.82	2.02	1.36
Log (Skill Premium; Stenographer-Typist)	0.07	0.31	1.10	0.43	0.44
Log (Skill Premium; Computer Programmer)	0.32	0.74	1.51	0.83	0.44

Notes: Tabulated for the sample of 66 surveys in the regression specification in Table 1, Column (2), where the dependent variable is the first principal component of the five political participation measures. Due to data limitations, the skill premium is available only for 29 countries for the Stenographer-Typist measure, and for 26 countries for the Computer Programmer

Appendix Table 3
Summary statistics: Comparative Study of Electoral Systems

	10th	Median	90th	Mean	Std Dev
<u>Measures of political participaton</u>					
(country-survey module means taken)					
Vote (0=Did not vote; 1=Voted)	0.72	0.85	0.92	0.83	0.10
<u>Individual-level controls (CSES)</u>					
(country-survey module means taken)					
Age	39.8	45.8	50.4	45.6	4.05
Gender (0=Male; 1=Female)	0.49	0.52	0.57	0.52	0.03
Marital Status (0=Not married; 1=Married)	0.57	0.64	0.70	0.64	0.06
Number of children	0.53	0.75	1.62	0.92	0.49
Student (0=Not Student; 1= Student)	0.02	0.05	0.09	0.05	0.03
Employed (0=Unemployed; 1=Employed)	0.46	0.60	0.68	0.59	0.10
Income quintile (1=Lowest; 5=Highest)	2.7	3.0	3.1	2.9	0.2
Education (1=Lowest; 8=Highest)	4.1	5.0	5.9	5.0	0.7
<u>Country-level variables</u>					
Log(T/L)	-2.47	-0.86	-0.19	-1.22	1.04
Log(K/L)	3.11	4.35	4.83	4.14	0.69
Log(H/L)	0.80	1.03	1.18	1.01	0.16
Log GDP per capita (constant 2000 US\$)	8.07	9.89	10.37	9.44	0.98
Log Population	14.74	16.54	17.91	16.33	1.55
Gini	27.71	31.98	49.30	34.76	8.36
ELF Ethnic	0.06	0.16	0.54	0.26	0.21
Democracy	7.4	10	10	9.1	1.8
Socialist (0=No; 1=Yes)	0	0	1	0.14	0.35
Obedience (0=Lowest; 2=Highest)	0.74	1.03	1.28	1.04	0.19
Compulsory voting (0=No; 1=Yes)	0	0	1	0.14	0.35
Log (Food and Ag raw mat / Total Exports)	1.54	2.30	3.47	2.40	0.88
Log (Ores and Fuel / Total Exports)	1.03	1.85	2.85	1.96	0.89
Log (Skill Premium; Stenographer-Typist)	-0.01	0.31	1.06	0.39	0.35
Log (Skill Premium; Computer Programmer)	0.32	1.01	1.66	0.99	0.45

Notes: Tabulated for the sample of 42 surveys in the regression specification in Table 4, Column (3), where the dependent variable is the binary voting variable. Due to data limitations, the skill premium measures are only available for 17 countries.

Appendix Table 4
Selected Correlation Coefficients between Country Characteristics

	Log(T/L)	Log(K/L)	Log(H/L)	Log (Food / Total Exports)	Log (Ores / Total Exports)	Log (Skill Premium; Stenographer-Typist)
Log(K/L)	-0.07					
Log(H/L)	0.02	0.85***				
Log (Food / Total Exports)	0.31**	-0.29**	-0.16			
Log (Ores / Total Exports)	0.06	0.11	0.11	0.03		
Log (Skill Premium; Stenographer-Typist)	-0.28	-0.66***	-0.60***	0.12	0.09	
Log (Skill Premium; Computer Programmer)	-0.26	-0.79***	-0.72***	0.11	-0.06	0.68***

Notes: ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively. As in Appendix Table 2, this is tabulated for the sample of 66 surveys in the regression specification in Table 1, Column (2), where the dependent variable is the first principal component of the five WVS political participation measures.