Schooling, Political Participation, and the Economy[*]

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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 propose an explanation that centers on how individuals allocate 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 increases both the level of political participation and its responsiveness to schooling, by lowering the opportunity cost of production income foregone. We find related evidence that political participation is less responsive to schooling in countries with a higher skill premium, as well as within countries for individuals engaged in skilled occupations, suggesting that these patterns are indeed influenced by the opportunity cost of engaging in political rather than production activities. We argue that 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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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. Empirical work in this line of inquiry has typically found 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). There is also a large body of related 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 regularly 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 cross-country differences in the extent of citizens' political

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[1] Contributions to this large literature include: Verba and Nie (1987), Rosenstone and Hansen (1993), Putnam (1995b), Verba et al. (1995), Bénabou (2000), Schlozman (2002), Dee (2004), Freeman (2004), Milligan et al. (2004), Hillygus (2005), and Glaeser et al. (2007). See also Chong and Gradstein (2009) who find a link between education and pro-democracy views.

[2] The idea that education engenders democracy dates back at least to Dewey (1916) and Lipset (1959). However, the issue of causality and the mechanisms that generate this relationship continue to actively debated; see Glaeser et al. (2004), Acemoglu et al. (2005), Glaeser et al. (2007), Bobba and Coviello (2007), and Castelló-Climent (2008).

[3] While 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.

[4] The data support these broad perceptions: 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 of 6.7 in Latin America (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 observation that even as human capital promotes political participation, it also plays a more basic economic role as a factor input in production activities. 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. Our goal is to uncover how these country characteristics systematically influence the micro-level relationship between schooling and political participation. To this end, 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. We pursue an empirical strategy that regresses these measures of participation against the interaction of individual schooling and country variables, while controlling for schooling and a comprehensive set of other individual attributes, as well as country-survey wave fixed effects.

The data reveal a robust empirical role for country factor endowments. Our key findings are summarized in Figure 1, which contains partial scatterplots of a measure of the responsiveness of political participation to schooling estimated for each WVS country-survey wave, illustrated with respect to several country variables. (See Section 3.1 for details on how these scatterplots were obtained.) Panel A reveals a statistically significant upward-sloping relationship, indicating that individual political participation tends to be more responsive to increases in schooling in countries with a greater per worker arable 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 significant relationship with per worker physical capital in Panel B.) Of note, cultural attitudes appear to play a complementary role, as countries that bear more favorable attitudes towards obedience exhibit a weaker link between individual schooling and political involvement (Panel D). Separately, we also find that the above effects are considerably weaker when we instead use a measure of voting from the CSES as our dependent variable (Section 3.3), a result which we discuss in more detail below.

[**FIGURE 1 HERE**]

Motivated by this evidence, we propose an interpretation that is based on the interplay between the production and political roles of human capital. A key premise here is that political participation requires the use of human capital. For individual citizens, it has indeed been argued that "political activities have 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.[5]

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[5]In 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.

We adopt the view that human capital expands an individual's capacity to process information and execute tasks, so that educated individuals are on average more productive in both the production and political spheres. In response to an increase in human capital, a rational citizen will thus choose to expand both production and political effort to make use of her increased capacity. The key question is then how much she will raise production effort relative to political participation. On the margin, this entails trading off the benefit of increased political participation, which is needed to contest the power of the government to tax or expropriate, against the opportunity cost of additional production income foregone.

In this setting, any socioeconomic or institutional force that makes the use of human capital in production less enticing will tend to raise the effort channeled towards political participation relatively more than that towards production. In particular, a greater abundance of the specific factor used in the least skill-intensive sector (such as 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; on the other hand, a greater abundance of the factor used in the most skill-intensive sector will have the opposite effect. This logic can be readily formalized by developing and solving a model of an individual's human capital allocation decision, as we show in the Appendix.

We present several supplementary pieces of evidence which provide further support for this underlying intuition. First, to the extent that the skill premium proxies for the income foregone from applying human capital to political rather than production activities, we should expect participation to be less responsive to increases in schooling in countries that feature a high skill premium. Consistent with that, we find evidence 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 4.1). Second, we obtain similar results with an alternative measure of the resource intensity of the economy based on export data (Section 4.2). Specifically, countries with a higher share of food and agricultural raw materials exports exhibit a stronger link between schooling and political participation. Last but not least, applying the same logic within countries, we would expect that individuals employed in skilled occupations would display a dampened link between political participation and schooling – while the converse relationship would hold for workers in unskilled occupations – because of the different opportunity costs they face. This is exactly what we see when we focus on variation within a single country, namely the US (Section 4.3).

Our proposed explanation also suggests how the link between political participation and schooling might vary across different forms of political activity. Intuitively, this relationship will be weaker for forms of participation that are less taxing in their human capital requirements. For instance, 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). This is consistent with the weaker results which we obtain with the voting data

from the CSES.[6] In this, our explanation is also consistent with, and provides a possible rationalization for the findings in several recent empirical papers that have uncovered settings where the relationship between education and voting was statistically insignificant (Tenn 2007, Kam and Palmer 2008, Berinsky and Lenz 2008).[7]

Interestingly, our 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 highlighted in our motivating East Asia versus Latin America example.[8] We argue that countries that feature a greater endowment of the factor used specifically in the least skill-intensive sector witness *ceteris paribus* 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.[9] We find some suggestive cross-country evidence that corroborates this intuition: Countries with higher initial per worker arable land endowments indeed witnessed smaller subsequent increases in average years of schooling between 1975-2000. This effect was strongest in countries that were not fully democratic, where our political economy explanation is likely more applicable. This argument is moreover *prima facie* consistent with observed initial endowment conditions: In relatively land-scarce East Asia, with its comparative advantage in labor- and skill-intensive production, 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 the 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.

Our paper falls within the aforementioned literature on the determinants of political participation and its links to schooling. An additional recent contribution in this line is Charles and Stephens (2009), who show that positive labor market shocks to earnings and employment tend to lower turnout in gubernatorial and senate elections within US counties, a result that is consistent with our opportunity cost logic. Our paper also relates to a growing literature on how initial conditions have influenced long-run country development. This work has identified how pre-existing land and resource abundance (Engerman

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[6]The weaker results with voting could also be due to a number of other factors. It may be that voting data based on respondent recall could be noisier than data on other forms of political participation that are not as associated with socially-approved behavior; it is for instance well-established that voting is over-reported in surveys (Bernstein et al. 2001). In that same vein, the principal components methodology we use to construct the WVS measure could help to filter out noise that is idiosyncratic to each single participation variable. Last but not least, the country coverage of the CSES is smaller, which yields lower precision.

[7]Kam and Palmer (2008) actually consider a composite index that is a simple average of a number of different (self-reported) forms of participation, voting included. This is quite possibly a noisier index of participation than our measure based on a principal components methodology. They also limit their attention to the effects of higher education.

[8]For 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.

[9]Incidentally, 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.

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and Sokoloff 1997, Acemoglu et al. 2002, Naritomi et al. 2007) and the disease environment (Acemoglu et al. 2008, 2009) help to explain the variance in institutional structures observed today, both across and within countries.[10] 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. Section 4 lays out our proposed explanation, and provides several further pieces of evidence in support of it. Section 5 extends the framework to consider the issue of state provision of schooling, and presents some suggestive evidence consistent with our predictions here. Section 6 concludes. The Appendix presents a model that rationalizes the opportunity cost intuition behind our proposed explanation of the empirical findings.

2 The Role of Country Characteristics: Empirical Strategy

2.1 Empirical Model of Individual Political Participation

We seek to understand how key country variables might 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:

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

where i indexes individuals. $PolPart_i$ is a 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 noise term. The common finding here has been a positive and highly significant β_2 coefficient, for a diverse range of participation measures. (However, as mentioned, see Tenn (2007), Kam and Palmer (2008), Berinsky and Lenz (2008) for some key exceptions.)

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

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[10]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.

specifications of the form:

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

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}) systematically alter the responsiveness of political participation to education at the individual level. We affix a time index on the country variables, since the data we use feature multiple surveys for the same country conducted in different years.[11] The full set of country-survey wave fixed effects (D_{ct}) controls for all country- and time-specific variables that might affect the average level 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 are relatively stable across time. This is reflected in the η_c error term in (2); the ε_{ict}'s are standard iid noise.[12]

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. It is nevertheless important to bear in mind that the estimation of β_3, which captures how the coefficient of education differs 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. Four waves of the WVS are available (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. Although the survey waves do not constitute a balanced panel of countries, the pooled data still gives us a large number of observations from 47 countries, with representation from all major continents. (Appendix Table 1 describes 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 base these measures on the following categorical response questions asked in the WVS (responses are recoded 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

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[11]We do not index the individual attributes, V_i and $Educ_i$ by time, since the surveys are not a longitudinal panel and we do not observe the same individual more than once in the pooled data.

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

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 fourth and fifth measures (*Demonstrate* and *Petition*), which are "hard" measures of political action. While the "soft" measures reflect 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 tangible political action that is less widely visible. Overall, this spectrum of variables provides a more comprehensive body of evidence than if we had focused exclusively on any single measure of participation.[13]

Some readers might be missing a discussion of voting, a measure of 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.[14] 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 conducting the survey, employing sampling methods

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[13]The 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 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.

[14]The 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 likely too noisy a measure of whether respondents would actually translate their intentions into action.

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 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, and we use this as another $PolPart_{ict}$ measure in logit regressions based on the specification in (2). It should be noted 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 African countries 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 in the WVS 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, and income decile – which we use in our vector of controls, V_i, in the regressions. The CSES includes respondent education, reported on a similar 1-8 categorical scale, as well as a set of other individual controls that is comparable to the WVS.[15]

This WVS and CSES survey data is then merged with several country-level variables (W_{ct}). As discussed in the Introduction, we are particularly interested in the role of country factor endowments, namely the per worker arable land, physical capital, and human capital stocks (T/L, K/L, and H/L, respectively). We will also use several other country variables as auxiliary controls, including real GDP per capita, population, Gini coefficient, and democracy. These variables are all from standard data sources, the details of which are documented 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 similar if contemporaneous values are used (available on request). (Appendix Tables 2 and 3 report descriptive statistics for the WVS and CSES country samples respectively.)

One final country variable of interest that warrants further discussion is related to the "values" or "culture" hypothesis, which has often been advanced as an alternative explanation for cross-country differences in political activism. This view, popularly termed the "Confucian" 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 try to account for these differences, we focus on the role of attitudes toward obedience. We base our measure of such attitudes on the following WVS question (responses 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

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[15]The CSES income variable is reported in quintiles rather than deciles, but its behavior is qualitatively similar in the regressions.

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

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 participation. This allows us in principle to extract the common component that reflects overall political participation, while discarding the noise that might be inherent in any single measure. 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 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. The results corroborate the common finding that political participation is indeed increasing in individual schooling for our pooled country sample. Of note, this effect is significant despite our controlling for the income decile of the respondent, so education does have explanatory power for political involvement that is independent of the positive effect of income status. The effects of the other individual controls are relatively unsurprising: Older citizens are more politically active, but this 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 workers. These patterns remain very stable across all specifications, even as we subsequently introduce country variables into the regressions.

3.1 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 variables are absorbed by the country-wave fixed effects, D_{ct}.) We find evidence in favor of a positive and significant effect on the interaction term with $\log(T/L)$, as well as a negative effect on the interaction with $\log(H/L)$. 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 schooling in countries*

with a higher average human capital endowment. While we also obtain a positive effect on the interaction term with $\log(K/L)$ here, this will turn out not to be robust in other specifications.

These patterns are validated when we subject the data to more checks in the rest of Table 1. In Column 3, we exclude potential outliers, by removing those countries that are more than three standard deviations away from the sample mean for any one of the three factor endowment variables. 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.

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 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 were used by the state for the purposes of indoctrination. Reassuringly, this does not change our results for the education interactions with country land and human capital endowments, with most of these auxiliary interactions exhibiting insignificant coefficients. (We also include an interaction with the measure of cultural attitudes on obedience, but we defer a discussion of this to the next subsection.) Column 6 includes a full set of interactions between respondent income decile and the country-wave fixed effects ($Income_i \times D_{ct}$), 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). The findings for the $Educ_i \times \log(T/L)$ interaction are indeed robust in spite of this extensive set of controls. The significance of the $Educ_i \times \log(H/L)$ coefficient falls however, although the point estimate remains negative.

In Column 7, we apply an imputation procedure for unreported individual variables, to address the concern that such missing observations in the WVS may not be random omissions. Following Glaeser et al. (2005), we assign the mean value observed within each WVS country-survey wave to the corresponding missing observations, while also introducing a set of dummy variables to indicate whether the value of the individual variable in question was imputed. We find this leaves our main conclusions intact, with the $Educ_i \times \log(H/L)$ coefficient now negative and significant again at the 10% level. Also, the overall effect of education on political participation does remain positive when all the country variables in the interaction terms are evaluated at their sample median values (a formal F-test yields a p-value < 0.001). Finally, Column 8 controls for respondent occupation, by including dummy variables based on broad self-reported

occupational categories.[16] We do not use occupation in our baseline individual-level controls because this would decrease our sample size by up to 10%. We accommodate this in Column 8 by including a category for missing occupation; as it turns out, this category yields a negative and significant coefficient (not shown), implying that individuals who do not report an occupation have a lower propensity towards participation. The results here are extremely similar to that in Column 7, confirming that the effects of education that we have found also hold within broad occupational groups.

Our central findings are best summarized in Figure 1. To obtain these partial scatterplots, we first ran the regression specification in (1) separately for each WVS country-wave, with the full list of respondent traits from Column 1 in our control vector, V_i. The β_2 coefficients estimated in this way capture the responsiveness of political participation to schooling in each country-wave. For each panel in the figure, we then regressed these β_2's against the set of country variables, W_{ct}, used in the Column 5 specification (per worker factor endowments and all the auxiliary country controls), excluding the country variable of interest in the specific panel; the regression residuals are then plotted against the country variable of interest. As anticipated by the Table 1 results, the responsiveness of political participation to schooling clearly rises with the per worker arable land endowment (Panel A). On the other hand, this link appears to weaken in more skill-abundant countries (Panel C). Reassuringly, there are no obvious outliers in the figures that might be unduly driving these observed patterns.

It is useful to provide a sense of how much country factor endowments affect the responsiveness of political participation to the accumulation of one more discrete unit of education (one step up the 1-8 scale). Focusing as an example on the Column 7 estimates, an increase in the land endowment, $\log(T/L)$, from the 25th (Germany) to the 75th percentile (Finland) would raise this marginal response to education by an amount equal to 0.06 standard deviations of the cross-country distribution of average participation scores. Repeating this calculation for $\log(H/L)$, a similar interquartile increase in the human capital endowment (from Spain to Germany) would decrease the marginal response to education by about 0.07 standard deviations. These are fairly moderate figures. Nevertheless, our sample does consist heavily of European countries with similar endowment ratios that tend to cluster around the sample median, so a larger increase would arguably better reflect the range of endowment ratios witnessed in practice around the world. The marginal response to education roughly doubles to +0.12 standard deviations if we consider an increase in $\log(T/L)$ from its 10th (Switzerland) to the 90th (USA) percentile; the corresponding figure is −0.12 standard deviations from increasing the human capital endowment from Indonesian to Norwegian levels. Alternatively, one can also gauge these quantitative effects by asking how much the responsiveness of participation to schooling would change as a result of these factor endowment shifts, when evaluating all other country variables at their sample median. In the case of the 25th to 75th percentile increase in $\log(T/L)$, this would raise the overall coefficient of education from an initial

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[16]The occupation dummies used here are based on the first digit of the occupation code reported in the WVS, namely: 1 for employer/manager; 2 for professional or non-manual worker; 3 for manual worker; 4 for agricultural worker; 5 for military; 6 for never employed; 8 for other. A separate category is included for unreported occupation.

value of 0.162 to 0.194, a more appreciable 19% increase. For $\log(H/L)$, a similar increase in country human capital endowments would lower the responsiveness to education by about 18%.

These conclusions based on the first principal component carry over in large measure when we examine each of the WVS participation variables separately in Table 2. The upper panel of Table 2 reports the results from OLS. 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 factor endowment variables, following Column 2 in Table 1; and (ii) a full specification including all auxiliary country interactions, following Column 7 in Table 1. (The results are similar with other specifications; available on request.) Regardless of 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, with the results especially strong for the land endowment interaction. The point estimates are always of the same sign, with the single exception of the ordered logit regressions using *Petition*, where the $Educ_i \times \log(H/L)$ coefficient is positive but not significant.

[**TABLE 2 HERE**]

We have thus far pooled together all available WVS waves to maximize the size of our main sample. Table 3 confirms that the findings are nevertheless qualitatively similar when we examine each wave separately. Columns 1-2 restrict the sample to Wave 3 (1994-1999), while Columns 3-4 focus on Wave 4 (1999-2004). (The Wave 2 sample is much more limited with only five countries, so we do not show those results.) For each subsample, we present two regressions, following the lean and full specifications from Table 2. The point estimates continue to reveal a positive interaction effect for the country land endowment, as well as a negative interaction effect with country human capital. While we do lose some statistical significance, this is not surprising given that the reduced sample entails a loss of efficiency. Overall, our central results do not appear to be driven by any single time period. (We return to the rest of the columns when we discuss the evidence from the CSES below.)

[**TABLE 3 HERE**]

3.2 Cultural Attitudes

To address the "culture" hypothesis, we explore whether 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.

We indeed find a negative and significant interaction effect between education and "obedience". This implies that *in countries inclined towards such attitudes and behavior, political participation tends to be*

less responsive to increases in individual schooling. This is also illustrated by the clear downward-sloping relationship in Panel D of Figure 1. Throughout Columns 5-8, this interaction coefficient is moreover very stable in terms of size and significance, while its quantitative implications are similar to those for country factor endowments. For example, the Column 7 estimates imply that moving from the 25th (Turkey) to the 75th (New Zealand) percentile country would decrease the marginal effect of individual schooling on political participation by about 0.06 standard deviations. These results are corroborated in Table 2. We consistently obtain a negative coefficient on the "obedience" interaction for each separate participation measure (even-numbered columns), although the results are slightly weaker for *Importance of Politics* and *Discuss Politics.* We also obtain negative point estimates, though not statistically significant, in both the Wave 3 and 4 subsamples (Table 3).

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 is clearly complementary to, rather than in direct conflict with, that of country factor endowments, as our prior empirical results on the effects of factor endowments are not displaced by the inclusion of the obedience interaction.

3.3   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 because voting has been viewed by political scientists as a very distinct form of political activity, that is generally less demanding in terms of its human capital requirements (Verba and Nie 1987, Brady et al. 1995). It has also been described by political sociologists as a "passive" activity, in contrast with the more "active" forms of participation aimed at influencing the political system (Milbrath and Goel 1977). The question then is: Does voting display the same patterns as the more active and effort-intensive forms of participation we have previously considered with regards to the effects of country characteristics?

Given the binary nature of the voting variable, we estimate (2) via a logit regression, with the findings reported in Table 4. Column 1 confirms the basic positive correlation between education and the propensity to vote in the pooled CSES data. Introducing the three factor endowment interactions with education in Column 2 however yields a set of statistically insignificant results; in particular, the coefficient on $Educ_i \times \log(H/L)$ 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, countries often have compulsory voting laws that make voting a *de jure* mandatory duty of citizens. While the extent to which such laws are enforced clearly varies, it would *a priori* be important to control for them in the vector W_{ct} of country variables, since they do influence citizens' propensity to vote, and could thus affect the link between voting and education as well.[17] We do this in Column 3, by including the

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[17]Verba et al. (1987) cite a study by Galen Irwin, who compared two elections in the Netherlands. In a 1970 election

interaction between individual education and a compulsory voting dummy variable (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.

[**TABLE 4 HERE**]

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 auxiliary interactions with country variables that we considered in Table 1.[18] In these two columns, we also find a positive and significant effect of country physical capital on the relationship between voting and education. The results are similar when we include the interactions between individual income and country-module fixed effects (Column 6), impute values for the missing individual variables (Column 7), or control for occupation dummies (Column 8).[19] Although the point estimate on $Educ_i$ is negative, the overall effect of individual schooling is still positive and significant when all country variables are evaluated at their sample median values (p-value from F-test <0.001). There are however other persistent indications that voting is qualitatively different from the other measures of political participation: 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, especially since voting can be construed as a form of participation often seen as a "duty" of citizens. We find also that democracy tends to reinforce the positive education-voting correlation, while greater ethnic fractionalization dampens this relationship. Looking back at Table 3, the patterns in the pooled sample are most similar to that when restricting attention to Module 2 (Columns 7-8); there appear to be some slight differences when running the regression on Module 1 (Columns 5-6), but there are only 11 distinct countries represented in that module.

In sum, while the role of factor endowments is present, particularly that of the land endowment, this is considerably less prominent than for the other more active forms of political participation surveyed in the WVS. It is moreover important to control for institutional features such as compulsory voting laws, in order to get a more comprehensive picture of voting patterns. These weaker results are certainly consistent with the idea that voting is inherently a very different form of political participation. Having said that, other features may contribute to this relative weakness. First, it has often been argued that voting data are fairly noisy, given their reliance on respondent honesty. Along these lines, the principal

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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).

[18]There 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.

[19]The occupation dummies are based on the first digit of the occupation code, namely: 0 for military; 1 for senior official/manager; 2 for professional; 3 for associate professional; 4 for clerk; 5 for sales and service staff; 6 for agricultural worker; 7 for craft and trade worker; 8 for plant and machine operator; 9 for elementary occupations. A separate category is included for unreported occupation; responses coded in Module 2 as "Refused", "Don't Know" or "Missing" are treated as unreported.

components methodology applied on the WVS measures may have helped to filter out noise in each separate variable more effectively, in order to focus on information that reflects common participation trends. Last but not least, the more limited country coverage in the CSES may also have hindered our ability to obtain more robust results.

4   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 higher arable land endowment per worker.

2. The link between individual schooling and political participation is *weaker* in countries that have a higher 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 human capital-intensive and 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 participation. We start from the position that human capital expands an individual's capacity to process information and undertake tasks in both production and political activities. In response to an increase in education, an individual would rationally choose to increase both production effort and political participation, with the salient decision being how much to increase one relative to the other. Intuitively, the opportunity cost of the production income foregone from devoting 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 an individual's political participation to increases in schooling in such countries.

We formalize these ideas in the context of a simple model, which we develop in detail in the Appendix. In this model, individuals can choose to allocate their human capital between three different production activities which generate direct output (namely, agriculture, manufacturing, or services). Alternatively, they can choose to apply some of their human capital towards political activities, which do not yield output directly, but rather help to protect their production output from expropriation due to bad governance

or rent-dissipation. We show that there will be a positive correlation between human capital and political participation at the individual level, since the higher opportunity cost of political participation for more educated individuals is counterbalanced by an increase in the benefit that can be obtained in the form of greater political checks. However, we also show that the strength of this correlation will depend on country characteristics, such as factor endowments, that affect the relative productivity of one's human capital across these different activities, and hence the opportunity cost of applying a marginal unit of human capital towards the political rather than the production sector.

This interpretation is moreover consistent with fact 4, that the effects of factor endowments are weaker for voting than for the more active forms of participation. Given that voting has been characterized as requiring relatively little time or effort, and hence bearing a relatively low opportunity cost in terms of production income foregone, one would expect that the intuition highlighted above would apply with less force to voting patterns.[20] That said, one 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 empirical exercises, that provide further support for our interpretation and explanation.

4.1   Skill Premium

While we have so far focused on the role of factor endowments, a quick generalization of our basic 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. In other words, a similar interaction term between individual education and a country measure of the labor market skill premium should be negatively correlated with political participation.

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 presented in a myriad of reporting concepts (for example, average earnings versus minimum wages) that makes direct comparisons difficult. 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. However, this data is very unbalanced in that countries rarely report wages for all occupations in all years. This will limit us in terms of the size of our eventual regression sample.

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[20]This is also consistent with the recent evidence pointing to a weak link, if any, from schooling to turnout in some settings (Tenn 2007, Kam and Palmer 2008, Berinsky and Lenz 2008).

We consider 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). Separately, we also use the wages reported for 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).[21] Although the two skilled occupations notionally reflect different skilled abilities, the two skill premium measures are highly correlated (Pearson correlation = 0.68).

[**TABLE 5 HERE**]

Table 5 reports these findings on the effect of the country skill premium. The regressions follow (2), with the country skill premium now included in the vector of country variables, W_{ct}. Column 1 reports a basic specification using the first principal component measure of political 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 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; this fall is more pronounced for the Computer programmer wage premium, where the coefficient is in fact no longer significant.[22] Moreover, the comparison with Table 1, Column 2, shows a very substantial drop in the coefficients associated with the factor endowment interactions. These smaller coefficient magnitudes suggest that the effect of country endowments operates at least partially through its influence on the country skill premium.[23] (Appendix Table 4 confirms that the two skill premia measures are highly correlated with factor endowments.)

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[21]We 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.

[22]This 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.

[23]This 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, the results with these instrumental variables are very much in line with the hypothesis: a negative and significant coefficient on the skill premium at the 5% level for both skill premia measures (results available on request).

Column 3 reaffirms these findings using the full specification from Table 1, Column 7, which includes in particular all the interaction terms between individual schooling and the auxiliary country variables. 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 present 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. This 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 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 role of factor endowments is linked to their effect on citizens' incentives over the use of their human capital. That said, one should be cautious not to over-interpret Table 5, particularly since the 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 view this evidence as being of a more supplementary and suggestive nature.

4.2   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 using export data, on the premise that resource-intensive economies are likely to display a higher share of natural resource exports.

Table 6 explores the use of such alternative proxies for the resource-intensity of the economy; the column specifications correspond to that in Table 5. 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 merchandize 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 with a larger export share in these latter resources. Note that including the export measures leads to a fall in the coefficient associated with the land endowment interaction (Columns 2 and 4), when compared to the corresponding specification in Table 1, Column 7. This once again suggests that the

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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 6 HERE**]

4.3   Occupational Skill Intensity: Within-Country Evidence

Our proposed interpretation of these findings in the data builds on the idea that the opportunity cost of engaging in political activities can differ systematically across countries, depending on the underlying structure of each economy in question. If this intuition is indeed operative, then we should in principle be able to identify similar effects with regards to the responsiveness of political participation to education within a single country, by comparing individuals with varying opportunity costs of their time.

One natural proxy for an individual's opportunity cost of time would be the nature of the occupation that he/she is employed in. To the extent that different occupations reflect different skill intensities, our logic would predict that the strength of the link between individual schooling and political participation would vary across occupations. More specifically, suppose we were to compare two individuals with the same education level, one of whom works in a skill-intensive occupation, while the other engages in an unskilled one. We would then expect that the latter would have a lower opportunity cost of engaging in political activities, particularly in an economy such as the US which features a high skilled wage premium.

To this end, we explore specifications of the form:

$$PolPart_{it} = \beta_1 V_i + \beta_2 Educ_i + \beta_3 Educ_i \times DumSkilled_i + Occ_i + D_t + \varepsilon_{it} \tag{3}$$

This seeks to explain the political participation of individuals (indexed by i) within a single country as a function once again of individual characteristics (V_i), including education ($Educ_i$). We now include an interaction term between individual schooling and a dummy variable, $DumSkilled_i$, indicating whether the respondent is in a skilled occupation. Occ_i denotes a full set of occupational dummies which control in particular for the main effect of $DumSkilled_i$, while D_t are survey wave fixed effects. We hypothesize that $\beta_3 < 0$, namely that skilled workers exhibit a lower responsiveness of political participation to individual schooling. This alternative look has the advantage of enabling us to check our underlying intuition within a single country, which helps assuage lingering concerns regarding unobserved cross-country differences that might have escaped our previous specifications.

Table 7 runs (3) on the subsample of US observations in the WVS, using the first principal component measure as the dependent variable. These US observations are from Waves 3 and 4; prior surveys in the US did not contain information on either individual schooling or political participation. In separate regressions not reported (but available on request), we have obtained similar statistically significant within-country findings for both Germany and Great Britain. For $DumSkilled_i$, we experiment with several definitions of what constitutes a skilled occupation in Columns 1-3. Our broadest definition in Column 1 codes as skilled all employers/managers, professional workers, non-manual workers, and skilled

manual workers.[24] Column 2 trims this definition to exclude employers/managers of fewer than 10 workers, since the skill requirement for running such small establishments is likely to be less demanding. Finally, Column 3 excludes all employers/managers from $DumSkilled_i$. The results across all three columns consistently support our underlying intuition. Overall, education is positively associated with political participation, but this effect is weaker for respondents in skilled occupations for whom the opportunity cost of time is presumably higher.

[**TABLE 7 HERE**]

Columns 4-6 perform the complementary exercise using an interaction term between individual schooling and an unskilled occupation dummy instead. Column 4 treats as unskilled all occupations not classified as skilled in the Column 1 specification, namely: semi-skilled and unskilled manual workers, farmer and agricultural workers, military members, as well as those who have never held a job or did not report one.[25] Respondents in unskilled occupations do indeed exhibit a higher responsiveness of political participation to schooling. One concern here is that this unskilled dummy may be very noisy: The agricultural sector and the military, or for that matter individuals with unreported occupation, likely features a heterogeneous mix of skill levels which the WVS unfortunately does not allow us to distinguish. Column 5 reruns the regression by removing these latter occupations from the definition of the unskilled dummy. We continue to find similar, if not stronger results for the positive interaction coefficient. Column 6 further removes individuals who have never held a job from the unskilled occupation dummy; the interaction coefficient remains positive, but is now marginally insignificant.

This within-country exercise thus provides reassuring supporting evidence that the responsiveness of political participation to schooling is indeed driven by an opportunity cost logic. In particular, the results suggest that for unskilled workers, the opportunity cost of production income foregone is indeed lower, and hence their greater willingness to devote a marginal unit of human capital to political rather than production activities.

5 Factor Endowments, Political Participation, and Public Provision of Schooling: An Extension

In this section, we pursue some broader political economy implications of our opportunity cost explanation. In particular, we can address one of the key motivating questions discussed in the introduction, namely what might lead country governments to select different paths of human capital accumulation.

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[24]Specifically, this comprises: employers/managers of establishment with 10 or more employed (WVS occupation code 13); employers/managers of establishment with fewer than 10 employed (16); professional workers (21); non-manual workers (22-25); foreman and supervisor (31); and skilled manual worker (32).

[25]This comprises: semi-skilled manual worker (WVS occupation code 33); unskilled manual worker (34); agriculture (41-42); armed forces (51); never had a job (61); and missing.

Consider a situation in which a (non-democratic) ruler were to decide on how much to invest in human capital for his citizens, under the knowledge that more human capital would increase productivity, but would also increase political participation. Although this is clearly a stark abstraction that puts aside nuances in the political system or the role of private agents in schooling decisions, it nevertheless helps to highlight the role that initial conditions can play in influencing the incentives of governing regimes to promote human capital accumulation.

As it turns out, we show in the Appendix model that *any variable that increases aggregate political participation will lead to less investment in human capital by the ruler.* This is because the ruler will anticipate the increased checks that an active citizenry would place on him, and will thus attempt to dampen this effect by investing less in the state provision of schooling initially. In particular, since a larger land endowment decreases the opportunity cost of applying human capital in politics by making it less productive in generating output, this in turn implies that *a country with a higher land endowment will invest less in human capital.*[26]

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 8, 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. We also include initial years of schooling in 1975 to capture possible convergence effects in the data, but our focus is on the other explanatory variables.

[**TABLE 8 HERE**]

As shown in Columns 1 and 2, the initial level of democracy in 1975 (as measured on a 0-10 scale in the Polity IV dataset) and the initial arable land endowment do not provide much explanatory power for increases in the total years of schooling for citizens. 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 a 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

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[26]That the ruler can compensate for factors that raise political participation by changing the amount of initial human capital investment implies that we need not expect any correlation between measures of political participation at the aggregate level and our country variables of interest, such as the per worker land endowment. 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.

Polity score). We take this last point as suggestive of a political mechanism, such as that which we have sketched out in our extension, being in operation.

These results are unaltered in Columns 4 and 5, where we further control for the initial 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.[27] 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 once again 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 are most significant in the regressions run with secondary and higher years of schooling (Columns 8-9), 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 an 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 increases in human capital towards political activities, which implies a weaker link between schooling and political participation.

This interpretation is consistent with the evidence we presented on how a higher skill premium is associated with a lesser impact of schooling on individual engagement with politics. Also in line with this interpretation, we showed that the natural resource-intensity of a country's exports, whose exploitation is

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[27]We 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).

presumably not intensive in human capital, has a similar effect to that of a greater land endowment. Last but not least, at the within-country level, we have also found the link between schooling and political participation to be weaker for individuals employed in skilled occupations.

We argue that our framework can help us to understand how initial endowment conditions may have influenced the human capital accumulation decisions that various country governments have pursued. This can even be seen 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 non-democratic 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.

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Data Appendix

A. Individual-level data

World Values Survey (WVS): Merged by ASEP/JDS, in collaboration with Tilburg University and Khöln Zentral Archiv. Data available at: http://www.jdsurvey.net/jds/jdsurvey.jsp. The 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 answer options range from 1='Inadequately completed elementary education' to 8='University with degree/Higher education - upper-level tertiary certificate'. For the occupation dummies, we use question X036.

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, and 0 that he/she did not vote. This variable is set to missing for a very small number of respondents whose answers exhibited inconsistencies, namely: (i) respondents who said they did not vote, but 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 1-8 scale, ranging from 1='None' to 8='University undergraduate degree completed'; this coding is largely comparable to that in the WVS. The dummy variable for compulsory voting is based on questions A5031 and B5037 in Modules 1 and 2 respectively. We recode these to equal 0 if there are no compulsory voting laws, and 1 if such laws exist. For the occupation dummies, we use questions A2008 and B2011 in Modules 1 and 2 respectively.

B. Country-level variables

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

Physical capital per worker, $\log(K/L)$**:** 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; this leaves out the transition economies in Eastern Europe. Physical capital stock is then divided by the population between ages 15-64.

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: $H/L = \exp(\phi(s))$, where s is the average years of schooling in the population over 25 years of age. Following Hall and Jones (1999), $\phi(\cdot)$ 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 $s > 8$. 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 good quality, namely with a 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 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 variable does not vary over time.

Wages: From Freeman and Oostendorp's (2001) Occupational Wages around the World (OWW) database, which in turn is based on the International Labor Organization's annual October Inquiry. The OWW presents several alternative calibration procedures for standardizing the raw data, but the resulting wage series are all highly correlated. To maximize the number of observations available, 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. Food exports is the sum of food and agricultural raw materials exports. Ores exports is the sum of mineral ores and fuel exports. Variables are expressed as a share of each country's total merchandize exports.

Appendix: Making Sense of the Data in a Model of Individual Political Participation

In this Appendix, we outline a simple theoretical framework that captures the basic insights of the opportunity cost explanation that we have advanced to rationalize the empirical findings in the paper. We should stress that while this is not meant to be a definitive structural model, it is nevertheless useful for formalizing the key conceptual issues. The modeling approach here is similar to several related papers that have investigated an effort-allocation problem between production and non-production or rent-seeking activities (Murphy et al. 1991, Dal Bó and Dal Bó 2009). All details of proofs can be found in an Online Supplementary Appendix.

Setup of the Model

Consider a representative citizen endowed with a fixed amount of human capital. She can choose to allocate this human capital (or synonymously, her labor effort) between different production activities which generate direct output (tending the land, manufacturing widgets, or writing software). Alternatively, she can choose to apply it towards political activities (attending political events, working for campaigns, lobbying the government, and generally keeping herself informed of political developments). Political participation does not yield output directly, but helps to protect her production output from expropriation by the state. We proceed to describe the model's ingredients.

Technology and Endowments. We consider a 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 the sectors, $j \in \{A, M, S\}$, is described by the following Cobb-Douglas production functions:

$$y_A = h_A^\alpha T^{1-\alpha} \tag{4}$$
$$y_M = A_M h_M^\mu K^{1-\mu} \tag{5}$$
$$y_S = A_S h_S^\sigma S^{1-\sigma} \tag{6}$$

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; 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 the human capital intensities in the agriculture, manufacturing, and services sectors:

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

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

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 be curtailed if citizens apply some of their labor effort towards political activities to check the executive's power. 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.For expositional ease, we set $\tau(X) = 1 - A_x X^{\sigma_x}$, where A_x is a positive constant satisfying $A_x (\sum_i H^i)^{\sigma_x} < 1$, and $0 < \sigma_x < 1$.[28] One can view A_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. σ_x in turn parameterizes the human capital-intensity of political participation, and can help us think about different forms of participation that may differ in terms of that intensity.

Citizens' Decision Problem. Each individual is risk-neutral and seeks to maximize her income, taking prices as given. The allocation decision facing a representative citizen with human capital H is:

$$\max_{x,\, h_A,\, h_M,\, h_S} \quad (1 - \tau(X)) \cdot \left(h_A^\alpha T^{1-\alpha} + p_M A_M h_M^\mu K^{1-\mu} + p_S A_S h_S^\sigma S^{1-\sigma} \right) \tag{7}$$

$$\text{subject to} \quad h_A + h_M + h_S + x = H \tag{8}$$

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

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. We then solve for a symmetric Nash equilibrium where the actions of all other individuals are taken as given as an individual decides how to allocate her human capital H across different production and political activities. In particular, each individual takes as given the aggregate stock of human capital allocated to the services sector, S.

Predictions of the Model

This simple framework delivers the set of relationships between factor endowments, schooling and political participation that is present in the data. First, the model predicts a positive correlation between human capital and political participation at the individual level, consistent with the basic stylized fact typically found in the literature:

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.*

Heuristically, this result is derived by totally differentiating the first-order conditions from the individual's maximization problem, as well as the human capital resource constraint; full derivations can be found in the Online Appendix. Not surprisingly, individuals with more human capital have more units of effective labor, and hence increase their effort allocated towards all activities including political

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[28]More generally, our results hold if $\tau \in [0,1]$, $\tau' < 0$, $\tau'' > 0$, $\tau(0) = 1$, and $\tau'(0) \longrightarrow -\infty$. For Proposition 2, we will also require an additional mild assumption that the third derivative of τ be either negative, or if positive, not too large.

participation, which is a "normal good".[29]

This result may seem a little puzzling when contrasted against the alternative intuition that more educated individuals ought to devote less effort to political participation because of their higher opportunity cost in production. What is important here is the broad view of human capital which we have adopted, namely that it raises an individual's capacity to undertake both production and political tasks. In effect, the higher opportunity cost of political participation for more educated individuals is counterbalanced by an increase in the benefit that can be obtained in the form of greater checks placed on the incumbent. The opportunity cost intuition can thus be more complex than a simple level effect.[30]

The nuances of the opportunity cost argument become evident when we consider how various country characteristics affect the magnitude of that elasticity of individual political participation with respect to education. This is described by the following:

Proposition 2 *The solution to the problem defined by (7) and (8) implies that:*

1. *$\frac{d^2 x}{dH dT} > 0$: A higher per worker land endowment increases the responsiveness of an individual's political participation to her level of education;*

2. *$\frac{d^2 x}{dH dK}$ 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. *$\frac{d^2 x}{dH dS} < 0$: 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 establishes the main results found in the data, and thus formalizes our intuition: 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. Since agriculture is the least skill-intensive sector, 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. The converse happens in countries where S is large, while the effect of K (used in the sector with an intermediate skill-intensity) cannot be signed.

The above model also offers a possible rationalization of the distinct results we obtained with the voting data. We can capture the distinctive feature of voting as one of the least demanding forms of participation by describing it as being of a relatively low human capital-intensity, as parameterized by σ_x. The following result characterizes what we should expect for this case:

Corollary 3 *The solution to the problem defined by (7) and (8) implies that $\frac{d^2 x}{dH d\sigma_x} > 0$: The responsiveness of an individual's political participation to her level of education will be smaller for less human capital-intensive forms of participation.*

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[29]This is a typical feature of game-theoretic models of rational voting, when human capital is assumed to improve individual quality of information (see Feddersen (2004) for an overview). Our approach can be thought of as a reduced-form manifestation of that intuition, in accordance to our interpretation of the role of human capital.

[30]The opportunity cost idea is also embedded in the fact that the absolute increase in x can coexist with a decrease in $\frac{x}{H}$. This can be shown to be the case in the aggregate equilibrium from the algebraic expressions in Proposition 5.

If human capital is less effective in political activity, the counterbalancing increase in the benefit stemming from political participation will be relatively small. The opportunity cost logic then implies that individuals will be less inclined to use their increased endowment of human capital in political activities. As a result, the level effect linking schooling and voting should be weaker than is the case for other more effort-intensive forms of participation, and by extension, so will the interaction effects involving schooling and country variables.

Extension: State Provision of Schooling

We now extend the framework to deal with the issues addressed in Section 5, specifically the question of what might lead 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.

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

Proposition 4 *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 bear clear parallels with that behind the familiar Rybczynski Theorem from international trade. Consider two countries, LA and EA, which are identical in all respects 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 LA to allocate more resources to the land-intensive sector, and less to the other two, when compared to 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.

We now apply this result to analyze the determinants of human capital provision. Consider now a (non-democratic) ruler who decides at an *ex ante* stage how much education, H, to provide to his citizens. This policy choice will need to take into account the level of participation (and hence of constraints on his discretion) that the ruler can subsequently expect from an educated citizenry. We develop this idea in a simple two-stage model, which we solve using backward induction.

Aggregate Political Participation. We first solve for what happens in the aggregate in our economy when the decisions of all N individuals are put together to determine aggregate political participation, $X \equiv Nx$. Imposing the symmetry assumption $h_{Si} = h_S$ for all i implies that $S = h_S$. Some straightforward algebra then yields closed-form solutions for our main endogenous variables, in any interior equilibrium:

Proposition 5 *Suppose* $\tau(X) = 1 - A_x X^{\sigma_x}$. *Then:*

$$h_A = \left(\frac{\alpha}{\sigma A_S p_S} \right)^{\frac{1}{1-\alpha}} T \tag{9}$$

$$h_M = \left(\frac{\mu A_M p_M}{\sigma A_S p_S} \right)^{\frac{1}{1-\mu}} K \tag{10}$$

$$h_S = \frac{N\sigma}{\sigma_x + N\sigma} H - \frac{\sigma}{\alpha} \frac{N\alpha + \sigma_x}{N\sigma + \sigma_x} h_A - \frac{\sigma}{\mu} \frac{N\mu + \sigma_x}{N\sigma + \sigma_x} h_M \tag{11}$$

$$x = \frac{\sigma_x}{\sigma_x + N\sigma} H + \frac{(\sigma - \alpha)\sigma_x}{\alpha(N\sigma + \sigma_x)} h_A + \frac{(\sigma - \mu)\sigma_x}{\mu(N\sigma + \sigma_x)} h_M \tag{12}$$

$$X = \frac{N\sigma_x}{\sigma_x + N\sigma} \left[H + \frac{\sigma - \alpha}{\alpha} h_A + \frac{\sigma - \mu}{\mu} h_M \right] \tag{13}$$

The Ruler's Problem. We now return to the ruler's decision on human capital provision in stage 1. Suppose 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 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 $k \in \{H, K\}$, $F_k'(\cdot) > 0$, $F_k''(\cdot) < 0$. Both types of capital will be used in production by individual citizens in stage 2, thereby increasing the production output of the economy; the ruler captures a share $\tau(X)$ of that output for his own consumption, C_2. The ruler's problem, with the costless simplifications of risk neutrality and no discounting, can thus be written as:

$$\max_{H,K} \quad C_1 + C_2$$

$$\text{subject to} \quad C_1 + F_H^{-1}(H) + F_K^{-1}(K) = Z$$

$$\text{and} \quad C_2 = \tau(X) \cdot N \left(h_A^\alpha T^{1-\alpha} + p_M A_M h_M^\mu K^{1-\mu} + p_S A_S h_S \right)$$

$$\text{and} \quad (9), (10), (11), (13)$$

$$\text{and} \quad K, H \geq 0.$$

Again focusing attention on interior solutions, we have the following result:

Proposition 6 $\frac{\partial H}{\partial T} < 0$: *A country with a higher land endowment will invest less in human capital.*

Figure 1
Partial Scatterplots of the Coefficient of Individual Education against Country Characteristics

A: Arable land per worker, Log (T/L)
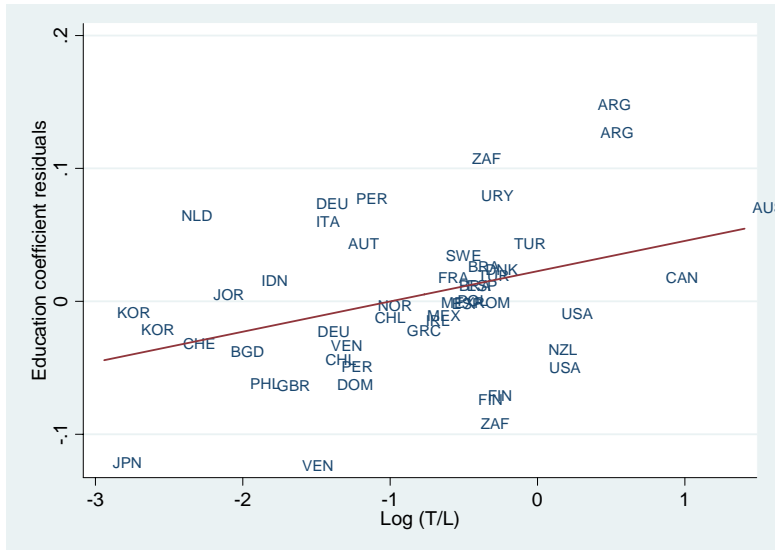
C: Human capital per worker, Log (H/L)
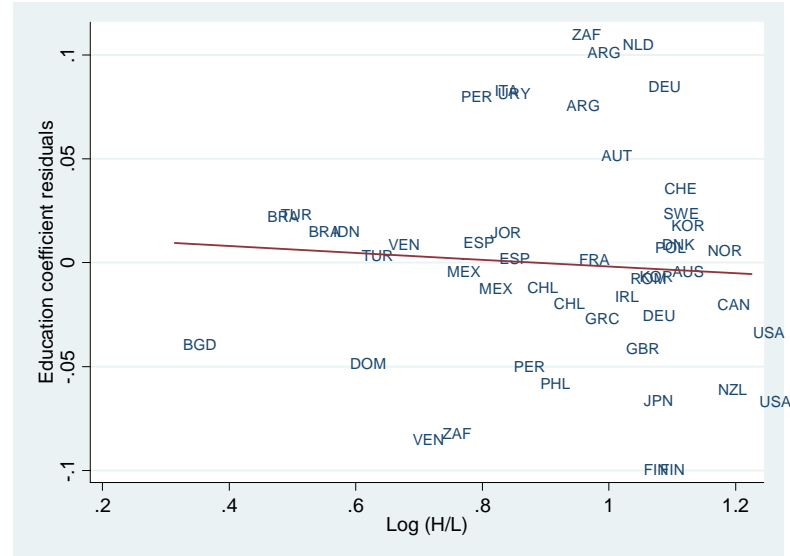
B: Physical capital per worker, Log (K/L)
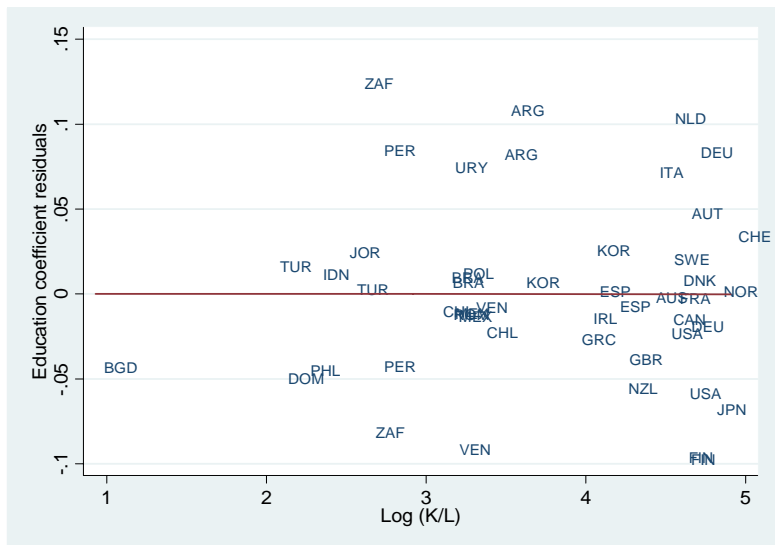
D: Obedience
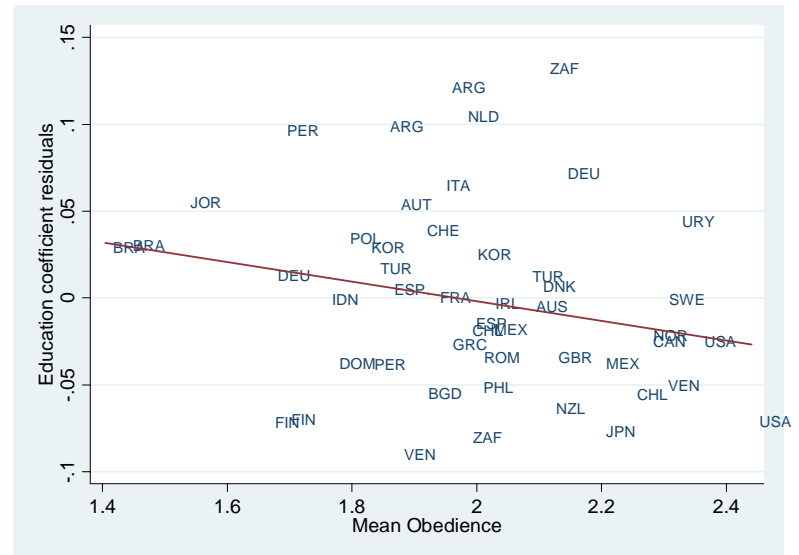
Notes: See Section 3.1 for details of how these scatterplots were obtained.

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

Dependent variable:	First Principal Component							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Education	0.166***	0.183***	0.189***	0.226	0.403*	0.306	0.352*	0.324*
	[0.008]	[0.035]	[0.036]	[0.215]	[0.199]	[0.192]	[0.185]	[0.184]
Education * Log(T/L)		**0.021***	**0.024***	**0.025***	**0.033***	**0.028**	**0.028**	**0.027**
		[0.005]	**[0.008]**	**[0.008]**	**[0.011]**	**[0.011]**	**[0.011]**	**[0.011]**
Education * Log(K/L)		**0.047***	**0.045***	**0.038**	**0.005**	**-0.003**	**0.018**	**0.014**
		[0.012]	**[0.012]**	**[0.039]**	**[0.033]**	**[0.035]**	**[0.036]**	**[0.034]**
Education * Log(H/L)		**-0.167**	**-0.163**	**-0.165**	**-0.148**	**-0.099**	**-0.129***	**-0.128***
		[0.073]	**[0.073]**	**[0.073]**	**[0.060]**	**[0.073]**	**[0.069]**	**[0.067]**
Education * Log GDPpc				0.005	0.019	0.025	0.011	0.012
				[0.030]	[0.028]	[0.028]	[0.029]	[0.028]
Education * Log Pop				-0.003	0.004	0.001	0.002	0.003
				[0.005]	[0.006]	[0.006]	[0.006]	[0.006]
Education * Gini					-0.002	-0.000	-0.001	-0.001
					[0.001]	[0.001]	[0.001]	[0.001]
Education * ELF Ethnic					-0.013	0.016	0.013	0.012
					[0.038]	[0.039]	[0.036]	[0.036]
Education * Democracy					0.001	0.001	0.002	0.002
					[0.003]	[0.004]	[0.004]	[0.004]
Education * Socialist					0.013	0.034	0.029	0.024
					[0.040]	[0.037]	[0.039]	[0.037]
Education * Obedience					-0.123**	-0.114***	-0.111**	-0.110**
					[0.045]	[0.038]	[0.046]	[0.046]
Age	0.042***	0.038***	0.039***	0.039***	0.045***	0.044***	0.045***	0.043***
	[0.004]	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]
Age squared	-0.00035***	-0.00031***	-0.00033***	-0.00033***	-0.00039***	-0.00037***	-0.00038***	-0.00038***
	[0.00004]	[0.00005]	[0.00005]	[0.00005]	[0.00005]	[0.00005]	[0.00005]	[0.00005]
Female? (1=Yes; 0=No)	-0.450***	-0.414***	-0.414***	-0.415***	-0.380***	-0.380***	-0.381***	-0.394***
	[0.029]	[0.040]	[0.040]	[0.040]	[0.028]	[0.028]	[0.027]	[0.028]
Married? (1=Yes; 0=No)	0.017	-0.008	-0.007	-0.007	-0.000	-0.000	-0.005	-0.002
	[0.017]	[0.021]	[0.021]	[0.021]	[0.022]	[0.022]	[0.018]	[0.017]
Number of children	-0.025***	-0.022***	-0.023***	-0.023***	-0.031***	-0.030***	-0.027***	-0.025***
	[0.006]	[0.007]	[0.007]	[0.007]	[0.008]	[0.008]	[0.007]	[0.007]
Student? (1=Yes; 0=No)	0.246***	0.245***	0.228**	0.227**	0.315***	0.309***	0.304***	0.351***
	[0.056]	[0.084]	[0.085]	[0.086]	[0.050]	[0.049]	[0.043]	[0.047]
Employed? (1=Yes; 0=No)	0.110***	0.112***	0.109***	0.109***	0.078***	0.076***	0.079***	0.019
	[0.016]	[0.020]	[0.020]	[0.020]	[0.023]	[0.025]	[0.021]	[0.026]
Income decile	0.037***	0.038***	0.037***	0.037***	0.043***	0.033*	0.044**	0.039**
	[0.006]	[0.009]	[0.009]	[0.009]	[0.010]	[0.019]	[0.020]	[0.019]
Country-wave fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Excl. outlier countries?	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Income * Country-wave?	No	No	No	No	No	Yes	Yes	Yes
Imputed Individual Controls?	No	No	No	No	No	No	Yes	Yes
Occupation dummies?	No	No	No	No	No	No	No	Yes
Observations	114192	74822	72996	72996	53763	53763	64583	64583
R-squared	0.21	0.24	0.24	0.24	0.25	0.25	0.25	0.25
No. of countries	72	47	45	45	36	36	36	36
No. of surveys	105	66	64	64	49	49	49	49

Notes: Standard errors are clustered by country, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively. All columns include country-survey wave fixed effects. Columns 3-8 exclude outliers with factor endowment ratios that differ from the sample mean by more than three standard deviations; this drops SGP (with a low T/L) and UGA (with a low K/L). Columns 6-8 control for income decile interacted with country-wave dummies. Columns 7-8 apply the imputation procedure for missing individual-level controls. Column 8 adds occupation dummies, including a category for unreported occupation.

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***	0.243***	0.073***	0.202**	0.070***	0.106	0.041**	0.139**	0.063***	0.023
	[0.015]	[0.079]	[0.014]	[0.097]	[0.015]	[0.072]	[0.018]	[0.066]	[0.019]	[0.085]
Education * Log(T/L)	**0.010***	**0.015***	**0.008***	**0.009***	**0.006***	**0.009***	**0.009***	**0.013***	**0.007**	**0.005**
	[0.002]	**[0.005]**	**[0.003]**	**[0.005]**	**[0.003]**	**[0.004]**	**[0.003]**	**[0.005]**	**[0.004]**	**[0.007]**
Education * Log(K/L)	**0.021***	**0.006**	**0.021***	**0.024**	**0.008**	**0.002**	**0.024***	**0.029***	**0.009**	**-0.015**
	[0.006]	**[0.021]**	**[0.005]**	**[0.021]**	**[0.005]**	**[0.013]**	**[0.005]**	**[0.012]**	**[0.008]**	**[0.017]**
Education * Log(H/L)	**-0.086***	**-0.077***	**-0.090***	**-0.099***	**-0.032**	**-0.032**	**-0.064***	**-0.025**	**-0.03**	**-0.019**
	[0.033]	**[0.041]**	**[0.029]**	**[0.032]**	**[0.028]**	**[0.025]**	**[0.028]**	**[0.022]**	**[0.038]**	**[0.032]**
Education * Obedience		-0.056**		-0.033		-0.027		-0.033**		-0.044**
		[0.025]		[0.021]		[0.017]		[0.013]		[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***	0.490***	0.163***	0.415**	0.233***	0.293	0.151***	0.425**	0.114***	0.241
	[0.033]	[0.174]	[0.029]	[0.195]	[0.050]	[0.226]	[0.054]	[0.192]	[0.041]	[0.208]
Education * Log(T/L)	**0.020***	**0.031***	**0.017***	**0.020***	**0.020***	**0.027***	**0.019***	**0.030***	**0.028***	**0.027**
	[0.004]	**[0.010]**	**[0.005]**	**[0.010]**	**[0.011]**	**[0.011]**	**[0.010]**	**[0.015]**	**[0.012]**	**[0.018]**
Education * Log(K/L)	**0.044***	**0.020**	**0.041***	**0.046**	**0.025**	**-0.003**	**0.062***	**0.051**	**0.029**	**-0.012**
	[0.012]	**[0.046]**	**[0.011]**	**[0.046]**	**[0.017]**	**[0.043]**	**[0.014]**	**[0.040]**	**[0.020]**	**[0.038]**
Education * Log(H/L)	**-0.193***	**-0.202***	**-0.198***	**-0.246***	**-0.117**	**-0.124**	**-0.202***	**-0.033**	**0.002**	**0.095**
	[0.074]	**[0.081]**	**[0.060]**	**[0.068]**	**[0.092]**	**[0.084]**	**[0.084]**	**[0.072]**	**[0.090]**	**[0.070]**
Education * Obedience		-0.113**		-0.064		-0.089		-0.094*		-0.119***
		[0.053]		[0.046]		[0.058]		[0.048]		[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 Columns 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. The odd-numbered columns report a lean specification containing the interaction terms between individual education and country factor endowments, following Table 1, Column 2. The even-numbered columns report a full specification, following 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 Political Participation: Different Survey Waves

Survey:	WVS Wave 3		WVS Wave 4		CSES Module 1		CSES Module 2	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	OLS	OLS	Logit	Logit	Logit	Logit
Education	0.204***	0.308	0.133**	0.441	-0.253	0.885	0.021	-0.754***
	[0.035]	[0.378]	[0.054]	[0.261]	[0.204]	[0.814]	[0.121]	[0.179]
Education * Log(T/L)	**0.011**	**0.016**	**0.022*****	**0.031**	**0.015**	**-0.066**	**0.049*****	**0.068****
	[0.008]	**[0.015]**	**[0.007]**	**[0.020]**	**[0.029]**	**[0.100]**	**[0.018]**	**[0.027]**
Education * Log(K/L)	**0.049****	**0.035**	**0.039****	**0.055**	**-0.052**	**0.829**	**0.062****	**0.456*****
	[0.021]	**[0.102]**	**[0.014]**	**[0.046]**	**[0.055]**	**[0.627]**	**[0.026]**	**[0.045]**
Education * Log(H/L)	**-0.215****	**-0.134**	**-0.074**	**-0.140**	**0.696****	**0.640*****	**-0.024**	**0.627*****
	[0.089]	**[0.099]**	**[0.098]**	**[0.116]**	**[0.295]**	**[0.090]**	**[0.066]**	**[0.080]**
Education * Obedience		-0.058		-0.134		1.088**		0.093*
		[0.078]		[0.080]		[0.430]		[0.053]
Education * Compul Vote					0.070	0.717***	-0.053	0.453***
					[0.052]	[0.135]	[0.051]	[0.092]
Country-wave fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Excl. outlier countries?	No	Yes	No	Yes	No	Yes	No	Yes
Income * Country-wave?	No	Yes	No	Yes	No	Yes	No	Yes
Imputed Individual Controls?	No	Yes	No	Yes	No	Yes	No	Yes
Observations	28874	24290	40822	37674	27094	22693	29884	26533
R-squared	0.25	0.26	0.23	0.24	0.14	0.16	0.11	0.12
No. of countries	26	20	35	27	18	11	24	16
No. of surveys	26	20	35	27	18	11	24	16

Notes: Standard errors are clustered by country, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels respectively. Columns 1-4 are estimated by OLS for WVS Waves 3 and 4. Columns 5-8 are estimated by logit regressions for CSES Modules 1 and 2. All Columns 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-wave/module fixed effects. The odd-numbered columns report a lean specification containing the interaction terms between individual education and country factor endowments, following Table 1, Column 2. The even-numbered columns report a full specification, following 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/module dummy controls; and applies the imputation procedure for missing individual controls.

Table 4
Education, Factor Endowments and Voting (CSES)

Dependent variable:	Vote? (1=Yes; 0=No; Logit Regressions)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Education	0.186***	-0.093	-0.144	0.256	-0.799*	-0.753*	-0.583	-0.532
	[0.023]	[0.130]	[0.166]	[0.430]	[0.469]	[0.433]	[0.428]	[0.413]
Education * Log(T/L)		**0.038**	**0.041***	**0.039***	**0.106*****	**0.104*****	**0.109*****	**0.108*****
		[0.023]	**[0.021]**	**[0.023]**	**[0.024]**	**[0.022]**	**[0.023]**	**[0.022]**
Education * Log(K/L)		**0.036**	**0.041**	**0.303*****	**0.381*****	**0.264****	**0.266*****	**0.279*****
		[0.036]	**[0.036]**	**[0.077]**	**[0.121]**	**[0.121]**	**[0.095]**	**[0.097]**
Education * Log(H/L)		**0.200**	**0.226**	**0.235**	**0.271**	**0.235**	**0.319****	**0.340*****
		[0.143]	**[0.169]**	**[0.147]**	**[0.170]**	**[0.145]**	**[0.124]**	**[0.124]**
Education * Log GDPpc				-0.191***	-0.282***	-0.239***	-0.240***	-0.255***
				[0.054]	[0.070]	[0.071]	[0.057]	[0.059]
Education * Log Pop				0.019	0.055**	0.060***	0.050***	0.051***
				[0.015]	[0.023]	[0.020]	[0.018]	[0.017]
Education * Gini					0.001	-0.002	-0.001	-0.001
					[0.008]	[0.007]	[0.006]	[0.006]
Education * ELF Ethnic					-0.526***	-0.481***	-0.452***	-0.448***
					[0.189]	[0.161]	[0.136]	[0.131]
Education * Democracy					0.056***	0.068***	0.062***	0.060***
					[0.013]	[0.013]	[0.012]	[0.012]
Education * Socialist					0.037	0.006	0.017	-0.001
					[0.080]	[0.065]	[0.068]	[0.066]
Education * Obedience					0.262	0.244	0.203	0.203
					[0.210]	[0.202]	[0.197]	[0.197]
Education * Compul Vote			**0.039**	**0.074****	**0.452*****	**0.460*****	**0.430*****	**0.435*****
			[0.046]	**[0.034]**	**[0.086]**	**[0.073]**	**[0.069]**	**[0.069]**
Age	0.083***	0.082***	0.083***	0.082***	0.077***	0.076***	0.073***	0.073***
	[0.008]	[0.011]	[0.011]	[0.011]	[0.012]	[0.012]	[0.010]	[0.010]
Age squared	-0.001***	-0.001***	-0.001***	-0.001***	-0.000***	-0.000***	-0.000***	-0.000***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Female? (1=Yes; 0=No)	-0.040	-0.060	-0.058	-0.054	-0.026	-0.024	-0.029	-0.060
	[0.041]	[0.048]	[0.047]	[0.047]	[0.048]	[0.048]	[0.044]	[0.044]
Married? (1=Yes; 0=No)	0.321***	0.305***	0.306***	0.307***	0.275***	0.251***	0.252***	0.257***
	[0.047]	[0.051]	[0.051]	[0.052]	[0.068]	[0.069]	[0.065]	[0.065]
Number of children	-0.004	-0.010	-0.009	-0.010	-0.013	-0.014	-0.015	-0.014
	[0.010]	[0.009]	[0.009]	[0.009]	[0.010]	[0.010]	[0.010]	[0.009]
Student? (1=Yes; 0=No)	0.549***	0.589***	0.588***	0.596***	0.523***	0.530***	0.470***	0.474***
	[0.107]	[0.128]	[0.128]	[0.127]	[0.137]	[0.137]	[0.123]	[0.123]
Employed? (1=Yes; 0=No)	0.122***	0.110***	0.112***	0.111***	0.130***	0.128***	0.125**	0.116*
	[0.037]	[0.036]	[0.036]	[0.037]	[0.047]	[0.047]	[0.055]	[0.060]
Income quintile	0.090***	0.111***	0.111***	0.112***	0.119***	0.221***	-0.089**	0.229***
	[0.016]	[0.020]	[0.020]	[0.020]	[0.022]	[0.041]	[0.037]	[0.021]
Country-Module fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Income * Country-Module?	No	No	No	No	No	Yes	Yes	Yes
Imputed Individual Controls?	No	No	No	No	No	No	Yes	Yes
Occupation dummies?	No	No	No	No	No	No	No	Yes
Observations	76461	56978	56978	56978	38064	38064	49226	49226
Pseudo R-squared	0.11	0.12	0.12	0.12	0.13	0.13	0.13	0.14
No. of countries	36	25	25	25	20	20	20	20
No. of surveys	59	42	42	42	27	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 6-8 control for income quintile interacted with country-module dummies. Columns 7-8 apply the imputation procedure for missing individual-level controls. Column 8 adds occupation dummies, including a category for unreported occupation.There were no country outliers with factor endowment ratios differing from the sample mean by more than three standard deviations.

Table 5
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***	0.252***	0.112	0.126	0.264***	0.023
	[0.015]	[0.047]	[0.246]	[0.234]	[0.051]	[0.278]
Education * Log (Skill Premium)	**-0.056***	**-0.054**	**-0.127**	**-0.113**	**0.001**	**-0.055**
	[0.013]	**[0.022]**	**[0.050]**	**[0.068]**	**[0.063]**	**[0.130]**
Education * Log(T/L)		0.011***		0.002		0.054
		[0.004]		[0.011]		[0.046]
Education * Log(K/L)		0.017		0.043		0.008
		[0.018]		[0.115]		[0.060]
Education * Log(H/L)		-0.102		-0.154*		0.286*
		[0.080]		[0.086]		[0.151]
Education * Obedience			-0.093	-0.100		
			[0.072]	[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***	0.248***	-0.172	-0.544**	0.314***	0.091
	[0.015]	[0.050]	[0.190]	[0.200]	[0.078]	[0.224]
Education * Log (Skill Premium)	**-0.066***	**-0.044**	**-0.069**	**-0.056**	**-0.056**	**-0.038**
	[0.015]	**[0.039]**	**[0.048]**	**[0.051]**	**[0.066]**	**[0.095]**
Education * Log(T/L)		0.012		0.025		0.102***
		[0.007]		[0.016]		[0.017]
Education * Log(K/L)		0.013		-0.117		0.055***
		[0.023]		[0.143]		[0.016]
Education * Log(H/L)		-0.071		-0.275***		0.112
		[0.091]		[0.081]		[0.102]
Education * Obedience			-0.003	-0.001		
			[0.042]	[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-wave/module 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 auxillary country characteristics (Log GDPpc, Log Pop, Gini, ELF Ethnic, Democracy, Socialist, and Obedience); excludes country outliers (SGP, UGA); includes the income by country-wave/module 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 6
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***	0.124**	-0.050	-0.089	0.165**	-0.106
	[0.026]	[0.048]	[0.173]	[0.250]	[0.068]	[0.170]
Education * Log (Food / Total Exports)	**0.015****	**0.020****	**0.032****	**0.039****	**0.029**	**0.006**
	[0.007]	**[0.008]**	**[0.009]**	**[0.011]**	**[0.027]**	**[0.024]**
Education * Log (Ores / Total Exports)	**-0.003**	**-0.003**	**0.002**	**0.003**	**-0.015**	**-0.034**
	[0.008]	**[0.007]**	**[0.005]**	**[0.006]**	**[0.022]**	**[0.036]**
Education * Log(T/L)		0.019***		0.002		0.046**
		[0.005]		[0.011]		[0.019]
Education * Log(K/L)		0.053***		-0.004		0.033
		[0.010]		[0.045]		[0.039]
Education * Log(H/L)		-0.179***		-0.158**		0.278
		[0.066]		[0.061]		[0.184]
Education * Obedience			-0.113***	-0.087**		
			[0.039]	[0.040]		
Education * Compul Vote					0.002	0.057
					[0.040]	[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-wave/module 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 includes the interactions between individual education and auxillary 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/module 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 7

Education, Occupational Skill Intensity and Political Participation: Within-US Evidence

Dependent variable: First Principal Component (WVS), US only

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS
Education	0.184***	0.197***	0.165***	0.117***	0.117***	0.123***
	[0.031]	[0.027]	[0.024]	[0.016]	[0.015]	[0.015]
Education * Skilled Occ Dummy	-0.067**	-0.091***	-0.054*			
	[0.034]	[0.031]	[0.029]			
Education * Unskilled Occ Dummy				0.067**	0.089**	0.063
				[0.034]	[0.039]	[0.043]
Survey Wave fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2323	2323	2323	2323	2323	2323
R-squared	0.16	0.16	0.16	0.16	0.16	0.16

Notes: Robust standard errors are reported, 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) survey wave fixed effects. Regression sample comprises the US WVS respondents in Waves 3-4 only. The skilled occupational dummy is defined by: all employers/managers, professionals, non-manual workers, and skilled manual workers (Column 1); less employers/managers of establishments with fewer than 10 workers (Column 2); less all employers/managers (Column 3). The unskilled occupational dummy is defined by: semi- and unskilled manual workers, individuals in agriculture, the military, who never had a job, or did not report a job (Column 4); less individuals in agriculture, the military, or did not report a job (Column 5); less individuals in agriculture, the military, who never had a job, or did not report a job (Column 6).

Table 8

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	-0.011	-0.024	-0.218***	-0.201***	-0.243***	-0.231***	-0.213	0.363**
	[0.047]	[0.048]	[0.047]	[0.066]	[0.065]	[0.058]	[0.049]	[0.135]	[0.180]
Democracy, 1975	0.006	0.009	0.044	-0.013	0.107**	0.126***	0.080**	0.041*	0.004
	[0.028]	[0.029]	[0.034]	[0.027]	[0.041]	[0.044]	[0.034]	[0.023]	[0.006]
Log (T/L), 1975		-0.118	-0.215**	-0.065	-0.158	-0.548**	-0.127	-0.315**	-0.057**
		[0.088]	[0.099]	[0.084]	[0.097]	[0.232]	[0.110]	[0.133]	[0.027]
Democracy * Log (T/L)			0.034*		0.037**	0.074**	0.023*	0.030*	0.008*
			[0.019]		[0.015]	[0.028]	[0.013]	[0.017]	[0.005]
Log (K/L), 1975				0.496***	0.580***	0.693***	0.294***	0.307***	0.059***
				[0.089]	[0.085]	[0.104]	[0.073]	[0.050]	[0.011]
Democracy * Log (K/L)					-0.033**	-0.035**	-0.035***	-0.005	-0.001
					[0.015]	[0.014]	[0.010]	[0.011]	[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.

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
Measures of political participaton					
(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
Individual-level controls (WVS)					
(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
Country-level variables					
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 measure.

Appendix Table 3
Summary statistics: Comparative Study of Electoral Systems

	10th	Median	90th	Mean	Std Dev
Measures of political participaton (country-survey module means taken)					
Vote (0=Did not vote; 1=Voted)	0.72	0.85	0.92	0.83	0.10
Individual-level controls (CSES) (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
Country-level variables					
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 political participation measures.