Does Democracy Make Taller Men? Cross-Country European Evidence

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Abstract: We study whether a democracy improves a measure of individual wellbeing; human heights. Drawing on *individual-level* datasets, we test the hypothesis using a battery of eight different measures of democracy and derived averages, and include models accounting for several confounders, regional and cohort fixed effects. We document that democracy - or its quality during early childhood - shows a strong and positive conditional correlation with male, but not female, adult stature. Our preferred estimates suggest that being born in a democracy increases average male stature from a minimum of 1.33 to a maximum of 2.4 cm. We also show a positive association when democracy increases from childhood to adolescence, and when we adopt measures of existing democratic capital before birth, and at the end of height plasticity in early adulthood. We also find that democracy is associated with a reduction in inequality of heights distribution. We finally find evidence of period-heterogeneity, namely, early democratizations are associated with taller people more than later ones. Results are robust to the inclusion of countries exposed to communism.

Keywords: democracy, wellbeing, human heights, waves of democratisation, communism, Europe, survey data.

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1. Introduction

Democratic political institutions are critical in keeping political regimes stable, influencing people's freedoms, and expanding health and other welfare programs (Deaton, 2013). Health policies and welfare programs play a key role in conditioning health-related behaviours at a younger age (Quinn and Woolley, 2001; Engler et al., 2021). For instance, exposure to democracy can inhibit potential environmental stressors, which are found to improve both subjective wellbeing (Benz and Frey, 2008), and economic growth and development (Collins and Rodrik, 1991; Persson and Tabellini, 2009; Acemoglu et al., 2019). The latter especially has an impact on nutrition and standards of living (Fogel, 2004; McKeown, 2014) and reflects in improvements in health outcomes (Mackenbach, 2013). In contrast, weak and unstable democracies are more conflictual than established autocracies (Vreeland, 2008, Regan and Bell, 2010), and democracies seem to be less efficient in dealing with infectious diseases (Troesken, 2015).

Other evidence suggests that exposure to democracy correlates, and might cause, longer life expectancy and lower child mortality. Democracies are more likely to exhibit a tighter agency relationship between citizens and politicians (Besley, 2006). Thus, political participation, selection, representation, and accountability, ultimately shape health policies that improve the health status of citizens (Besley and Kudamatsu, 2006; Kudamatsu, 2012; Fujiwara, 2015). One reason is that democracies are more likely to expand public health programs to wider sectors of the population. Similarly, democracies are more effective in spreading health-related information and are associated with lower levels of economic inequality, and pollution (Lake and Baum, 2001; Baum and Lake, 2003; Winslow, 2005; Wigley and Akkoyunlu-Wigley 2011; Deaton, 2013; Batinti et al., 2021). This paper contributes to this research.

We study the conditional association between democracy and heights. Human stature is a relevant measure of health and wellbeing as the differences between actual and potential height is sensitive to the opportunities (positive stressors) and impediments (negative stressors) occurring during early childhood and adolescence. During these life phases of an individual, heigh-velocity - expressed as cm growth per year - reaches a second peak during adolescence and about half the level experienced in early childhood (e.g., Beard and Blaser, 2002). In other words, *the gap between the genetically predetermined and the actual height is influenced in great part by the mediation of a wide set of psychosocial and environmental stressors* occurring in these two phases before adulthood (Eveleth et al., 1976; Stinson, 1985; Komlos and Snowdon, 2005). Thus, the height an individual achieves at the age of 20 years, is considered an established retrospective marker of human health and welfare during childhood, and, to a lesser extent, during adolescence (Tanner 1987, Steckel, 1995, 2009).

Several studies estimate that approximately 20 percent of the variation in human height is due to 'beneficial environmental' factors (Stunkard et al., 1986; Silventoinen et al., 2000). Yet, an important empirical question is whether the exposure to autocracies or democracies (extensive margin) and the progress towards a more democratic society (intensive margin) do affect the heights level in the population.[3] Specifically, exposure to democracy during crucial times of an individual's body high-plasticity (Fogel 2004; McKeown 2014) can help closing the gap between actual and genetically set potential of an individual height. Such effects are likely to

[3] There is also research exploring: how right- and left-wing governments in democracies affect health. The evidence seems to point towards left wing governments increase health spending, while right-wing government reduce waste and improve efficiency (Alexiou and Trachanas, 2021; Kokashvili and Shin, 2020). The role of civil conflict on stature has been explored in Akresh et. al (2012). While to our knowledge there is no direct research on the effect of economic recessions on adult height, Bozzoli et al. (2014) explores the effect of recessions exposures on birth weight indicating a negative effect strongly moderated by mothers' education.

differ by gender (Stinson, 1985) and specific cohort-age effects that capture the heterogeneous nature of different waves of democratisation (Huntington, 1997).

We contribute to the existing literature in the following ways. First, we extend the previous analysis of the health effects of exposure to democracy. Our approach differs from previous studies in that we estimate the effect of exposure during the years around birth on future adult height. While earlier research has focused on child mortality and life expectancy (Besley and Kudamatsu 2006; Nobles et al, 2010; Kudamatsu, 2012; Mackenbach, 2013), it is known that child mortality is not informative about the changes in the quality of life upon survival at a given age[4]. In contrast, measures of human stature are sensitive to post-childhood survival variability (Deaton, 2013) and are mostly free of measurement error related to several individual and environmental health stressors occurring during adult age (Strauss and Thomas, 2007). Given that height is fixed from young adulthood until an individual's early fifties when human bodies start experiencing shrinking (Stinson, 1985; Beard and Blaser, 2002), studies examining changes in human stature have the advantage of ruling out the confounding effects of a whole series of omitted variables that could bias the estimates. This could also explain why part of the literature finds no or even slightly negative correlation between democracy and health, especially so when infant or child mortality is used as its indicator (Costa-Font et al., 2020).

Second, previous studies examining the effect of democracy on human stature are mostly concerned with single-country analysis, where all individuals are exposed at the same time to the same institutional transition (Komlos and Kriwy, 2003; Komlos and Snowdon, 2005; Costa-Font and Gil, 2008; Costa-Font and Kossarova, 2019). This paper instead exploits the variation

[4] Similarly, improvements in life expectancy at birth are often explained by the contribution of the reduced child mortality on overall life expectancy, and especially so in developing countries.

of democracy within a sample of individuals from a varied set of European countries with different political regimes transitions in different years within the 1959-1999 period.[5] The present study differs also from other recent studies in the literature, such as Batinti et al., (2021), insofar as here we use *individual contemporary data* from multiple countries instead of relying on historical data examining the effect of franchise extensions on country-level averages, and only on male stature. Here instead, we exploit the rich cohort-specific and cross-country heterogeneity of European countries.[6] Overall, we document a robust and positive conditional correlation between democracy and male height. We also find that the total gain can be decomposed in two-thirds during childhood and one-third during adolescence, which is in line with the dynamics of height velocity during the pre-adult growth phase of an individual.

Third, the use of individual data allows examining differential effects by gender, which as we show are crucial. We exploit gender differences and support the idea that women are found to be more resilient to adverse environmental changes than men (Stinson, 1985). Specifically, we find that democratic institutions *increase* the gender height gap (gender dimorphism) by increasing males' height while registering no effect on women. However, the increasing gender dimorphism, while increasing a dimension of gender health inequality, implies no height costs to women.

Finally, though establishing causality is challenging, our estimates provide a *relatively* more precise identification than previous studies (Komlos and Kriwy, 2003; Komlos and

[5] There is also a literature on the transition effects from the Soviet regime. In many Eastern European countries formerly under the Soviet Union, there was a deterioration in living standards right after transition and before any visible improvements took place (Adeyi et al. 1997; Terrell and Garner 1998; Milanovic 1998; Svejnar 2002; Stillman 2006; Adsera Ribera et al. 2019).

[6] Robustness tests are conducted using two comparable datasets – the 1st wave of the EHIS dataset, and the Eurobarometer, survey 64.3. They support our main findings using the ESS7 survey.

Snowdon 2005; Costa-Font and Gil, 2008; Costa-Font and Kossarova, 2019) as we exploit evidence from a sample of countries, controlling for *individual's level covariates*, a varied set of exposed cohorts spanning throughout several decades, a set of country-level controls, and a fine-grained set of regional fixed effects derived by aggregating the geolocation of respondents below countries' level. The multilevel structure of our dataset also helps in ruling out possible reverse causality issues, which might be a problem in cross-sections or panels of countries. Our preferred estimates suggest that birth or early life spent in a democracy increases the average stature of men by about 1.4 to 2.4 cm compared to a non-democracy.

The rest of the paper is organized as follows. The next section provides an overview of the related literature. Section three describes the data, section four reports the results, section five documents the heterogeneity and robustness tests, and the final section concludes.

2. Related Literature

Democracy and health. Changes in exposure to democracy (or in democratic quality)[7] result from restrictions in political participation (Aidt et al., 2006), to avoid revolutionary threats (Acemoglu and Robinson, 2000; Przeworski, 2009), or as a way for the elites to rebalance their power (Lizzeri and Persico 2004). Unstable political regimes exert a detrimental influence on the growth of children (Tanner, 1992; Frongillo and Hanson, 1995). According to the "fit through democracy" (Sen, 1999) hypothesis, democracy incentivizes the inception of institutions that have an impact on the wellbeing of citizens. Democracies improve subjective well-being through improved procedural fairness which fosters an individual's sense of agency (Dorn et al., 2007).

[7] Important here to clarify that our distinction between the term *quality* refers to the use of dichotomic instead of categorical indicators of democracy, and not to the use of such measures *provided* a country can be defined a democratic.

Evidence from Regime Change. Evidence from the German reunification (Komlos and Kriwy, 2003; Komlos and Baur, 2004; Heineck, 2006; Hiermeyer, 2008;) suggests that West Germans were found to be taller than East Germans (approximately 1cm) and, importantly, such a gap appears to have widened only after the Berlin Wall was built (Komlos and Snowdon 2005) which can be traced back to the standards of living of both children and youth in the West (Komlos and Snowdon, 2005; Hiermeyer, 2008). Conversely, since unification, there has been convergence in heights between East and West German males but, paradoxically, not among females (Komlos and Kriwy, 2003). Similarly, it has been found that, after the US annexation, the height of Puerto Ricans increased more than twice concerning the average rate for Latin America and the Caribbean (Marein, 2020).

Gender effects. From an evolutionary standpoint, there is now a wealth of research showing that male height is more sensitive to environmental stressors (Stinson 1985; Bobák et al., 1994; Pollet and Nettle 2008; Bielecki, Haas, and Hulanicka 2012, Cullen et al. 2016). Moreover, there is debate if autocratic political systems, especially the ones of the communist type, did or did not manage to change job segregation and wage gaps by gender, or if were able to remove traditional gender roles, educational attainments especially in the sciences, and the proliferation of women in low-paid and low-status activities (Anachkova, 1995; Van der Lippe and Fodor, 1998). Even so, it is not obvious if women benefited more than men from processes of economic and political liberalization. If women reacted less to the change in environmental stressors promoted by democratic transition and had less to gain in terms of gender gap *relative* to the one in democratic regimes, we might expect an increase in gender dimorphism after democratization. Hence, factors as cultural persistence (Alesina et al., 2013) and recent evidence of former socialist systems being effective in pushing gender equality policy agendas (Lippmann

and Senik, 2018; Lippman et al. 2020) seem to support, though indirectly, the increase in gender dimorphism. Another explanation is that women are more resilient to socioeconomic stressors in general (Stinson, 1985; Cullen, 2016), and by consequence, the ones induced by autocracies might be no exception. Goldin and Lleras-Muney (2019) find that female health improvements depended mostly on the reduction in infectious disease, especially during adolescence; these effects were predominant concerning household or social gender/son preferences or institutional and economic settings. Indeed, Komlos and Kriwy (2003) find evidence of a positive effect of the German unification on males, but not on female stature. Similarly, (Costa-Font and Kossarova, 2019) document that the heights changes in the former Czechoslovakia primary reflected in changes in male heights. An exception, the effect of the Spanish transition to democracy is found to have had little effect on gender dimorphism (Costa-Font and Gil, 2008), where improvements in gender equality with Spanish democratization were likely at the root of the similar effects for men and women.

3. Data and Empirical Strategy

We use a multi-level dataset overlaying country and individual-level data. Countries provide cross-variation in political regimes to identify the effect on individual heights and are merged with individual data according to the year of birth of the respondent, so that (i) we can track the (non) democratic status of a country where the respondent was residing at the time of birth, and (ii) years identify *cohort-age effects* along the period 1959-1999.

3.1 Country-level data

We first report the sources and definitions of the data at the country level. Democracy data are from the following sources: (i) from the Polity IV dataset we use the variable Polity2; (ii) two

dummy variables from the Boix, Miller, and Rosato (BMR) data, Version 3.0 of the data; (iii) the V-Dem database (Version 9) and (iv) a measure of exposure to Soviet communism.

The Polity2 score aggregates several negative and positive components, each describing institutional features characteristics in autocracies and democracies. The final indicator is a multicategory variable scoring political regimes from -10 (fully autocratic) to +10 (fully democratic). We transform this score into a 0-1 dummy, the variable Polity2 (D), where 0 classifies a country as an autocracy if the original Polity2 score is less than 0, and 1 if the polity score is greater or equal than 0.[8] The BMR (D) variable is conceived already as a dummy, the detailed methodology adopted is discussed in Boix, Miller & Rosato (2013). Briefly, the BMR (D) index follows Dahl (1971) where the two main criteria for being considered a democracy is having the dummy equal to 1 if a country has jointly (i) free and competitive elections, and (ii) more than half of the adult male population can vote. We also use a recent version of the dataset (BMR, Version 3 - 2018), which also includes the variable Female Vote (D). This dummy is created by requiring that also more than half of the *female* adult population has the right to vote and joins the male electorate in formal political participation. The V-Dem (Version 9) aggregate indicators of democratization are also used to measure the democratic status; the additive index V-Dem Additive, and the multiplicative index, V-Dem-Multiplicative. Both scores are continuous and normalized into a 0 to 1 index and are the result of a bottom-up aggregation of several indicators also from the same database, each of them indicating a typical dimension of democracy. To report coefficient sizes, we multiply both scores by ten. Another difference with

[8] Here we follow the recent Acemoglu et al. (2019) on the effect of democratization on growth. While this is, to some extent, an arbitrary threshold, the results, robust to several measures of democracy from different sources allay concerns that our results depend on the policy dummy. Please, see Bogaards, M. (2012) on other literature using the 0-threshold including other papers using alternative thresholds when constructing the polity dummy. See also Gründler and Krieger, T. (2021a) for an up-to-date critical review on pitfalls to be aware when constructing democratic indexes.

the Polity and the BMR data is that V-Dem indicators are based on experts' opinions about countries' political regimes. Finally, the Communist dummy is constructed by using the 6 out of the 21 countries which have been exposed to communist regimes; these are Czechoslovakia (1948-1990); Estonia (1936-1992); Hungary (1949 – 1990); Lithuania (1936-1989); Poland (1952-1989) and Slovenia (1945 -1991). We then create a dummy equal to 1 if the period covered corresponds to those shown above and 0 otherwise. Overall, we will test our model for each of the seven measures of political democratizations introduced above. These are: (i) the V-Dem Additive Index (ii) the V-Dem Multiplicative Index (iii) the Polity Score (iv) the Polity Dummy (v) the BMR Dummy and (vi) the BMR Female Franchise[9]; (vii) finally, the Communist Dummy.

From the V-Dem dataset, we also include Healthcare Access, a five-category variable (0 – 4) indicating the level of accessibility of healthcare services to the population. Other country-level controls, widely used in the literature on heights, are the Infant Mortality rate, the gross-domestic-product per capita in logarithmic form – GDP per capita (Log). These are from the Gapminder dataset which combines the series from official sources such as the World Bank – World Development Indicators and other official sources of cross-country statistics. Finally, the Conflict Intensity variable is from the UCDP/PRIO Armed Conflict Dataset (Version 19.1) from the Uppsala Conflict Data Program. This variable is created from a yearly average per country of the intensity-level variable in the conflict. This is 0 for no conflict, 1 for minor conflicts between 25 and 999 battle-related deaths each year, and War/high conflict status for at least 1,000 battle-related deaths each year.

[9] Female franchise refers to female electoral rights in addition to male franchise.

3.2 Individual-Level Data

Individual data on heights and other people's characteristics are from the 7th wave of the European Social Survey (ESS7). The study started in 2014, interviews and data were collected between 2015 and 2016. The ESS7 contains self-reported heights expressed in cm and age at the time of respondence, which allows to compute the year of birth of the respondent and merge to the democracy data according to the year of birth to generate a measure of exposure to democracy. Years of birth allow us to control for cohort fixed effects, together with the country of residence and even sub-regional residential location of the respondent. This allows two fixed-effects strategies; one controlling for country fixed-effects, and one finer-grained that uses sub-regional fixed effects obtained from our combination of NUTS1 to NUTS3 locations of the respondents available for a substantial portion of the sample and derived from the name of the regions of residence available in the dataset. Oher controls from the ESS7 are the dummy Female (equal to 1 if the respondent is female) and Parent's education, a multicategory variable from 0 to 14. This variable is constructed first by aggregating the ISCED classification of educational degrees of both the mother and father of the respondent in 8 categories. This produces a 0 to 7 multicategory variable for each parent, once summed they produce the single measure of both parents' education, spanning from a minimum level of 0 to a maximum of 14. We then select only the adult population from 20 to 55 years old, for which height does not change. Finally, country-level democratic variables are merged with the *year of birth* of respondents, derived by knowing the age of the respondent at the time the survey has been run in 2006.

3.3 Descriptive statistics

Our samples contain individual records according to the following criteria. We select: (i) only individuals for whom the country of birth and residence coincide[10]; (ii) only plausible human

[10] Later in the paper we relax this restriction and show robustness.

heights above 130cm to avoid including misreported height;[11] and (iii) we rely on information from people aged between 20 and 55 years, for whom their stature is unlikely to vary.[12] Our final sample is made of 21 countries, 251 subregional territories, and includes 6 countries that have been exposed to communist regimes: Czechoslovakia (1948-1990); Estonia (1936-1992); Hungary (1949 – 1990); Lithuania (1936-1989); Poland (1952-1989) and Slovenia (1945 - 1991). For this reason, in addition to examining the effect of the different measures of democracy described in Table 1, we run specific regressions, where the treatment of interest is a dummy identifying the communist period indicated above.

Table 1 shows the descriptive statistics of the selected sample made of 21 European countries and 19,442 measures of individual heights. We also note that, given the selected age span during which height is fixed, there is no advantage in using longitudinal data with individual fixed effects. We merged the individual data with 6 measures of democracy drawn from the V-Dem, the Polity IV project dataset, and the Boix, Miller & Rosato (BMR) data. A seventh measure is a communist dummy, whose construction has already been explained above. Samples differ depending on the country and time coverage of the democratic index used. We also consider individual-specific controls (gender and parental education) and country-level controls (GDP per capita, health care access, conflict intensity, and infant mortality).

Figure 1 and Table A0 report the number of observations and average heights of the 21 European countries in our sample. Ranging from a maximal average of 175cm in the Netherlands and Denmark to 167cm in Portugal.

[11] Note in doing this we are self-selecting the sample *against* our findings, as most self-reported small heights are from autocracies.
[12] Changes in the age bracket from 18 to 50 do not report significantly different results.

[Insert Table 1 and Figure 1 about here]

3.4 Empirical strategy

By construction our data is from a cohort dataset; the sample contains adult population from 20 to 55 years old taller than 130cm and whose country of response coincides with the country of birth as described in Table 1. We consider a battery of measures of democracy depicted by (DEM_{jt}), which varies by country/NUT region j and across time t which also corresponds to respondents' *year of birth*. We consider gender differences (FEM_i) which vary at the individual level. The resulting dataset is thus a cohort multilevel dataset with both individual and country-level records. We thus estimate the following equation:

$$H_{ijt} = \beta_0 + \beta_1 DEM_{jt} + \beta_2 FEM_i + \beta_3 \left(DEM_{jt} \times FEM_i\right) + \boldsymbol{\gamma}' \boldsymbol{X} + \tau_t + \mu_j + \varepsilon_{ijt} \qquad (1)$$

where H_{ijt} is the adult height, measured in cm, of an individual i selected if between ages 20 and 55 years old, and born at year t in region/country j. Equation (1) then considers a series of individual and country-level controls, as well as time/cohort (τ_t) and country (or subregion) μ_j dummies. β_1 measures the effect of exposure to democracy or the change in democratic quality on heights for men, and $\beta_1 + \beta_3$ captures the same effect but on women. Similarly, in the equation (2) we consider the heterogeneity resulting from the wave of democratisation. More details on the classification of the waves are offered in subsection 5.1.

$$H_{ijt} = \alpha_0 + \alpha_1 DEM_{jt} + \alpha_2 \left(DEM_{jt} \times WAVE_t\right) + \alpha_3 FEM_i + \alpha_4 \left(FEM_i \times DEM_{jt}\right) + \boldsymbol{\rho}' \boldsymbol{X} + \tau_t + \mu_j + \varepsilon_{ijt} \qquad (2)$$

4. Results

4.1 Baselines results: democratic quality and democratic exposure

Table 2 reports the baseline estimates where we examine the effect of the 6 different measures of democracy. As a premise, we interpret the results when using the continuous (V-Dem indexes) or multicategory (Polity2 score) in columns 1 to 3 as effects of *democratic quality*: the reason

being that these measures account for various degrees of *intensity* of how a country is democratic or not, so they capture the intensive margin of democratization. On the other hand, we interpret results in columns 4 to 6 as overall effects of *democratic exposure* because in these cases dummies are used, so capturing the extensive margin of democratization. Concerning results of *democratic quality* in columns 1 to 3, we also report the beta coefficients in squared brackets in a third row below the coefficients and relative standard errors; the beta coefficients account for the effect of one standard deviation change in each reference index/score of democracy. We then report the effects of *exposure to democracy* - on individual heights, for which instead beta coefficients are not shown as columns 4 to 6 report the effects of the three dummy measures, one derived from the Polity2 score and the other two directly from BMR. Moreover, estimates reported in panel A do not include country-level controls, which instead are included in Panel B, and with the addition of the full battery of regional (228 to 230 according to the regression) and Year/cohort (37) dummies. Finally, in all regressions, we use both country and year (cohort) double-clustered SEs to account for within-group correlations which might bias our estimates.

Estimates suggest that, irrespectively of the democracy index we examine, a one standard deviation change in each of the three indexes reported in columns (1) to (3) increases male stature by a remarkably similar magnitude 0.34cm (V-Dem) to 0.12cm (Polity)[13]. Consistently, columns (4) to (6) suggest that living in a democracy increases average male stature by roughly 2cm. However, no significant effects are found for women, except when we consider the V-Dem index (column 1, Panel A) where we find a significant but small 0.09cm increase in stature,

[13] V-Dem index has been multiplied by 10, so ranges from 0 to 10, while polity ranges from -10 to +10. So, estimates are consistent across measures because 1 V-Dem point scale is roughly about twice the value of the polity index score.

which, however, loses significance when the same regressions include country-level controls (see column 7, Panel B). When we add additional controls to the estimates in Panel B (columns 7 to 12), we find that one standard deviation of each of the measures of democratic quality increases stature by 0.44-0.53cm, and a country being a democracy increases stature by 1.4cm to 1.55cm. Hence, these results suggest robust evidence of important anthropometric wellbeing improvements from exposure to democracy and improved democratic quality, captured by changes in individual-level heights. However, these effects are not significant among women, which is consistent with literature suggesting higher female resilience to institutional changes.

[Insert Table 2 about here]

4.2 Cohort heterogeneity

Next, Table 3 contributes to the identification and exploits the possible cohort heterogeneity derived from including respondents from the overall wide period available spanning from 1959 to 1995. This considers the effects of the exposure to the different waves of democratisation, which might have had peculiar characteristics. We generated a multicategory variable, Wave, which splits the cohorts into four periods. Period 1959-1968, which is followed by 1969-1977, 1978-1986, and finally 1987-1995. We then interact the democracy measure with each subperiod using the first one as the baseline. As before, the table is divided into two panels depending on the inclusion of country-level controls. Not surprisingly results suggest that the effects of democracy on height are larger among countries that were consolidated democracies before 1969, irrespectively of the inclusion of country-level controls. The effect size of democracy indexes varies depending on the index examined but estimates range from 0.4cm to 0.15cm increase for each standard deviation increase in the democracy index. The effect of exposure to democracy is robust and suggests a 2.5cm increase in heights with exposure to democracy, including female franchise. However, it suggests that the effect varies by the wave of

democratisation, and more specifically across waves. Importantly, coefficients of the first two waves are negative, which suggests that the effect of democracy is on heights is smaller compared to the main coefficient. Table 3 reports the joint significant coefficients and finds that the height effect for the period 1969-77 was slightly small we 0.34cm to 0.12cm for each standard deviation increase the democracy index. Similarly, the effect of countries transitioning out of communism was large and close to the main effect, suggesting an effect size that varies between 0.39cm and 0.17 cm depending on the index. Similarly, when we examine the effect of exposure to democracy, we find an effect 2.12cm (2cm for female enfranchisement) increase in countries in the wave 1969-77, 2.6cm (2.4cm for female enfranchisement) in countries exposed to the 1987-95 wave. The latter suggests a very large effect that can be attributed to transitions out of communism. As before V-Dem reveals higher effects than Polity, which can be explained by the wider range of social features that the V-Dem index considers. Finally, it is worth mentioning a small effect of the wave 1978-86 given the small number of countries included. While our estimates are robust to this heterogeneity test, they show non-trivial heterogeneity effects which could only be elicited by using cohorts' data spanning almost four decades.

[Insert Table 3 about here]

5. Robustness Checks

5.1 Including regional period-specific dummies (fully absorbed model)

One potential concern in our empirical strategy is that democracy only varies at the country level. Furthermore, there might be significant regional heterogeneity that goes unaccounted in country-level analysis which might result from differences in historical legacies that are not captured by country-specific fixed effects among others, and generic differences from populations across countries. Hence, as a first robustness check, we include w whole battery of period-specific regional dummies (804) which capture any regional period-specific effects on

heights. As before the upper panel does not consider country-level controls and the lower panel does. Estimates are consistent though suggest smaller effect sizes. One standard deviation change in any of the two democracy indexes considered increases male heights now of 0.28-0.1cm when no country controls are included, and 0.22-0.06cm when we control for country controls. Similarly, exposure to democracy increases male heights by 1.7-1.5 cm (without controls), and 1.2-1 cm when controls are included. Female enfranchisement delivers consistent estimates of a 1.4cm increase in height without controls and an imprecisely estimated coefficient of 0.8cm when controls are included. As before effects are found among women.

[Insert Table 4 about here]

5.2 Including sample whose country of birth is different from the country of interview

One potential concern in our estimates is the presence of selective migration. Hence, a second robustness check reported in Table 5 refers to the inclusion of individuals that do not live in their country of interview. This expands the sample by a few thousand individuals and suggests comparable results to those of Table 2. Both with and without controls.

[Insert Table 5 about here]

5.3 Omission of former communist countries

A third potential explanation of our results is they are driven by the transition to democracy of former communist countries, as opposed to the effects of democracy as such. To test for this effect, we add another robustness checks which examines the omission of countries that became democracies after 1989 as they transitioned out of a Communist regime in Table 6. Importantly, our estimates are consistent and provide comparable effects size both on the effect of a one standard deviation change in a democracy index and the effect of exposure to democracy.

However, the effect is slightly smaller which suggests that transition countries, which have transitioned to democracy more recently, exert a stronger effect in pushing European heights up in our previous estimates.

[Insert Table 6 about here]

5.4 Using evidence from alternative data sources

A final concern to examine further refers to the specific sample sampling design of the main survey. Hence, one additional robustness check lies in examining whether the same robust are found when we use alternative datasets, and specifically two such as the European Health Interview Survey and Eurobarometer. More specifically, Table A5 and A6 in the appendix reveal estimates comparable to those presented in Table 2. However, the Eurobarometer 64.3 survey reveals slightly smaller coefficients of both changes in democratic quality and exposure to democracy. In contrast, estimates of the European Health Interview Survey suggest comparable effects sizes.

5.5 Effects of Communism Exposure

As an extension, we study the effect of exposure to communism, to examine whether the effects are comparable to those of democracy exposure that we reported before. We estimate the following equation where COM_{jt} measures exposure to communism, t refer to the year of birth of an adult i who is aged between 20 and 55 years at the time of answering the survey in-country (or subregion) j as below:

$$H_{ijt} = \beta_0 + \beta_1 COM_{jt} + \beta_2 FEM_i + \beta_3 \left(COM_{jt} \times FEM_i\right) + \boldsymbol{\gamma}' \boldsymbol{X} + \tau_t + \mu_j + \varepsilon_{ijt} \qquad (3)$$

estimates are reported in Table 7 and consistently with those of Table 2, we find that exposure to communisms was detrimental to male heights but not female heights. The effect turns out to be even stronger when country controls are included, and overall suggests a reduction of 1.16cm in men heights resulting from exposure to communism. Estimates are comparable when our sample considers individuals that do not live in their country of birth. Hence the effects consistently suggest that the absence of democracy due to exposure to communism exerts an expected detrimental effect on human stature.

[Insert Table 7 about here]

5.6 Additional Evidence using Machine Learning Democratic Indexes

Some of the democracy measures used until now are not exempt from possible critiques and the results need to be interpreted with caution. Recently, Gründler and Krieger (2021a)[14] show that V-Dem aggregate indexes tend to overestimate the democratic effect; also using the 0 threshold for the Polity2 score is arbitrary as any other threshold, and potentially can create measurement bias as well, or problems in the interpretation of the results. To address these issues, here we expand the original set of made of 6 measures of democracy to the two Machine Learning Indexes, taken from Gründler and Krieger (2021b). In doing so, we dispose of eight measures of democracies and rerun our baseline estimates testing the equality of the coefficients. Figure 2 and Table 8 report our results, which are divided into two groups of four measures each. For simplicity, we report only the results using the four country-level controls. The first four are the indexes spanning from 0 to 1; to this end, we normalize the (-10;10) Polity Score to a 0 to 1 index and include the two V-Dem aggregated indexes and the Continuous Machine Learning Democracy Index.

[Insert Figure 2 & Table 8 about here]

Columns (1) to (4) show that the Continuous Machine Learning Democracy Index (CMLDI) is a lower bound threshold (1.471cm) which has a maximum when using the normalized Additive V-Dem score (2.4cm). The Wald test for the difference between the CMLDI and Additive V-Dem shows that the two coefficients are statistically different at the 10% level (p-value of 0.057). The other two remaining indicators (V-Dem and the Normalize Polity Score), though

[14] The paper focuses on the relationship between democracy and economic growth, but many of the observations and comments there can be translated in our context.

larger than the CMLDI are not statistically significant from it. Columns (5) to (8) repeat the same Wald test comparing the four dummies BMR, BMR (Female Enfranchisement), the Polity Dummy, and the Dichotomous Machine Learning Democracy Index (DMLDI). Our test show again that - while as expected from the analysis in Gründler and Krieger (2021a) – smaller but still positive, statistically and economically significant estimates. Overall, our tests seem to allay concerns that our results were depending on using aggregate indexes or arbitrary thresholds for the Polity dummy construction. They, however, also confirm the critiques offered in Gründler and Krieger (2021a), showing that the most prudent estimates are derived by using the machine learning indexes, with positive and robust conditional correlations of 1.471 and 1.329 cm. In conclusion, this set of estimations confirms the overestimation bias, but at the same time shows a positive, significant, and still economically nontrivial effect of the ML indexes and some significant difference only for the V-Dem additive index.

5.7 Childhood vs Adolescence Heterogeneity

As explained in the introduction, we expect most of the effects to be present if an individual is born in a democracy, because it is during this phase of life that height is mostly plastic, showing the max height velocity right after birth. There is, however, a second peak during the inception of adolescence that occurs earlier in life for females, at about 12 years old, and later for males, at about 14 years old (Beard and Blaser, 2002; Figure A5 of the paper Appendix). The second peak is only half the early childhood one (about 18-20cm per year to 8-10cm per year at peaks) but still contributes nontrivially to the overall growth. To check if there is an additional contribution from being in a democracy during adolescence, we calculate the average level of democracy for each of the eight democracy variables, which is centred around the 12^{th} year of life for females and around the 14^{th} year of life for the male population. Then we calculate the difference between the average of the adolescent age and the democracy's value at birth; the distributions of these differences for each democracy measure are displayed in Figure A6.

[Insert Table 9 about here]

Our results confirm that *once controlling for the democratic status at birth,* an incremental change during the second highest peak of height velocity adds another 40 to 50% to the overall height, which is consistent with the dynamics of the height plasticity chart presented in Figure A5.

5.8 Democracy and Democratic Capital

We explore the idea that it is not democracy at birth, but the stock of democratic capital that influences adult heights (Ross, 2006; Persson and Tabellini, 2009; Gerring, 2012). To capture the democratic capital effects, we look at the results when using several moving averages around the year of birth to evaluate the democratic stock influence on adult height, and consistently with the democratic capital hypothesis, we find a progressively increasing democratic effect as we expand the average from (t-1,t,1+1) to +/- 5,10,15,20 intervals, where t is the year of birth.

[Insert Table 10 about here]

We also run a similar exercise but look only at the effect of the status of the democratic stock at birth, computing averages starting from 1, 5, 10, 15, and 20 years before birth. Figure 3 (Table A7 for the full results). Show the expected results where the peak effect is obtained including up to 15 years before birth and slows down when furtherly increasing to 20 years before birth. Overall, these results both confirm the democratic capital hypothesis.

[Insert Figure 3]

5.9 Distributional Effects and Quantile Regressions Results

Height inequality is a critical proxy for economic and social inequality (Baten, 2000, 2012; Boix, 2014). The last test proposes quantile regressions to explore the distributional effects of being born in a democracy. Figure 4 and Table A8 show that most of the effects happen at the lowest quantiles (the ones with the shorter population), the evidence thus suggests that democratization reduced heights differences among men, making heights distribution more equal.[15]

[Insert Figure 4 about here]

6. Conclusion

This paper uses individual data from several European countries to examine the effect of both exposures to democracy and changes in the democratic quality on a retrospective measure of individual wellbeing, namely adult stature.

We exploit the cross-country and cohort variation in individual exposure to different political regimes and more gradual improvements in democratic quality. Our estimates rely on several different estimates, include a rich set of regional and cohorts' dummies from several decades, and include several controls, control for heterogenous effects from waves of democratisation, and look at specific regime changes, namely the exposure to communism regimes. Our results are robust to several robustness checks.

[15] While we cannot rule out that there might be bias in heights self-reporting, (Ng, 2019), we were not able to find literature proving that democracies show a larger upward bias than autocracies. Even in the case where we cannot rule out cultural factors, the respondents from the 21 countries in the ESS7 are relatively high in democracies' scores.

Consistently with other work in the literature (Batinti et al, 2020), we find that democracy exerts a large effect on male heights, we estimate that exposure to democracy increases heights by 2cm, and one standard deviation change in a democracy index increases heights by 0.78cm. These results not only confirm previous ones conducted by using life expectancy at birth and child mortality but extend and integrate them by showing that such health effects might be more long-lasting as they persist after childhood survival and are recorded in peoples' bones.

We find that the effect is more pronounced in early cohorts, though it does not disappear in the ones born in the two subsequent decades, while consistent with the literature on the health costs of transition from communism we obtain weaker results especially for those born and exposed during the period 1985-1995 which contains primarily communist transition.

Our estimates suggest no effect among women, which explains that democracies might give rise to some level of gender-height dimorphism. This is consistent with a series of studies showing how women's health gains have been generated mostly from reductions in infectious disease, especially those more influential during adolescence and menstrual age when women's bodies experience novel stress, are more subject to anemia and are overall weaker. On the other hand, women are more resilient to social preferences and institutional and political changes. We also find that this is true for general indicators of democracy and democratic quality as well as for the specific ones concerning transitions from communism. Finally, estimates are robust to sample definitions and by including a whole set of countries of birth, though different from the countries where responses to the ESS7 survey were made. Finally, an extension of our estimates suggests an effect of exposure to communism on heights, and we find that consistently with the

periods' heterogeneity test, exposure to communism reduces human heights by only about 1cm, about half of the 2cm has been observed across all type of political regimes.

These results suggest that both democracy and changes in democratic quality play a role in influencing anthropometric wellbeing; democracy makes us taller. The absence of democracy influences environmental stress and influence (the inequality in) the access to health behaviours which can limit children's child height potential.

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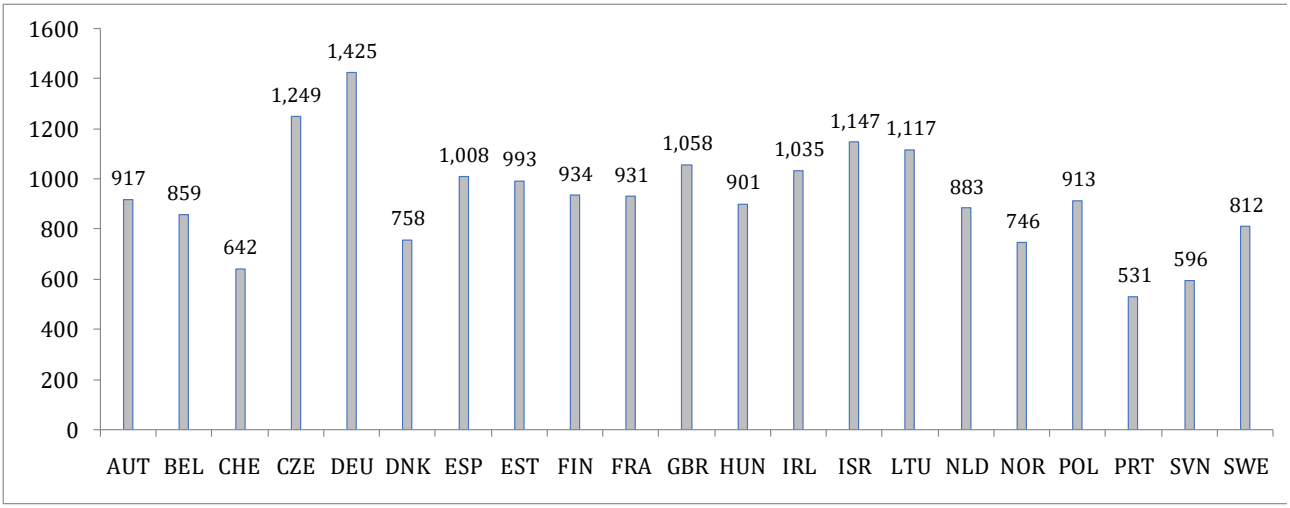
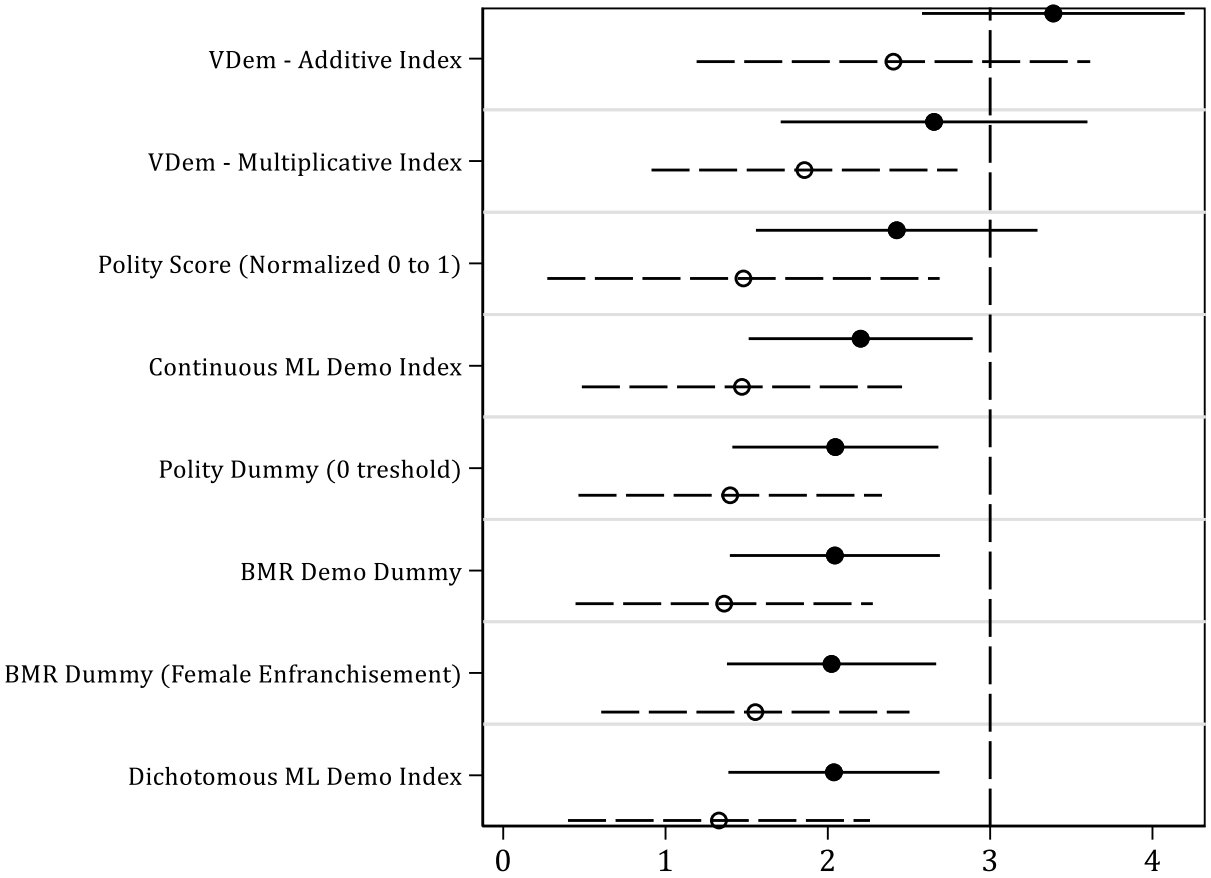
Figures & Tables

Figure 1. Average Height by Country and Sample Size



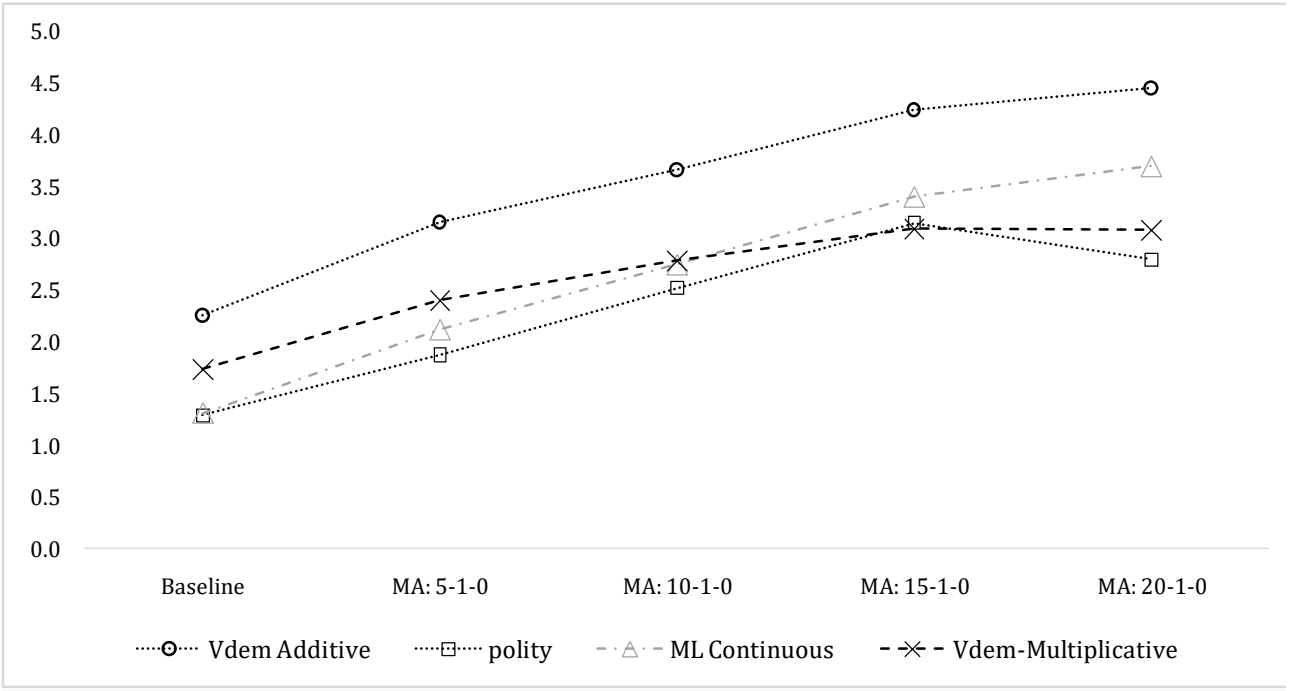
Notes: Data source is ESS7. Sample of the 21 countries for which country of respondence is the same than country of birth.

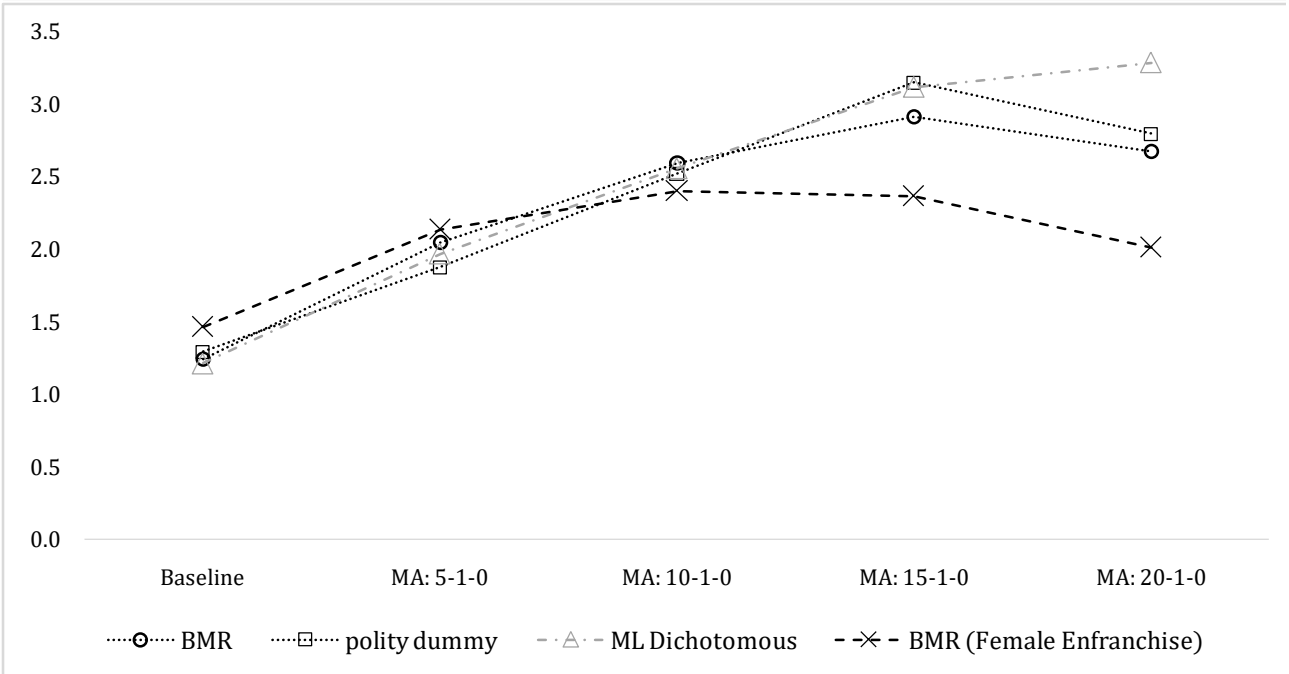
Figure 2. Results Adding Machine Learning Democracy Indexes



Notes: solid; coefficients from regressions without country-level controls. Dashed: coefficients from regressions including country-level controls. Bars show a 95% confidence interval. See also Table 8 I the main text reporting the full results.

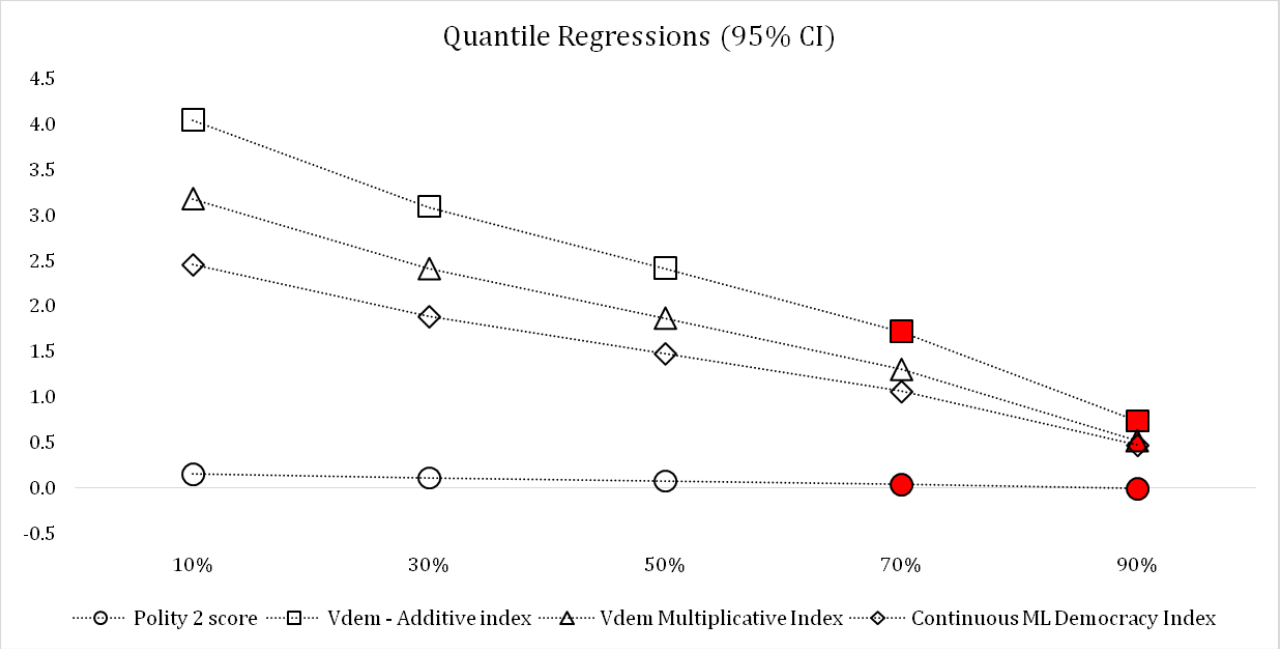
Figure 3. Democratic Capital

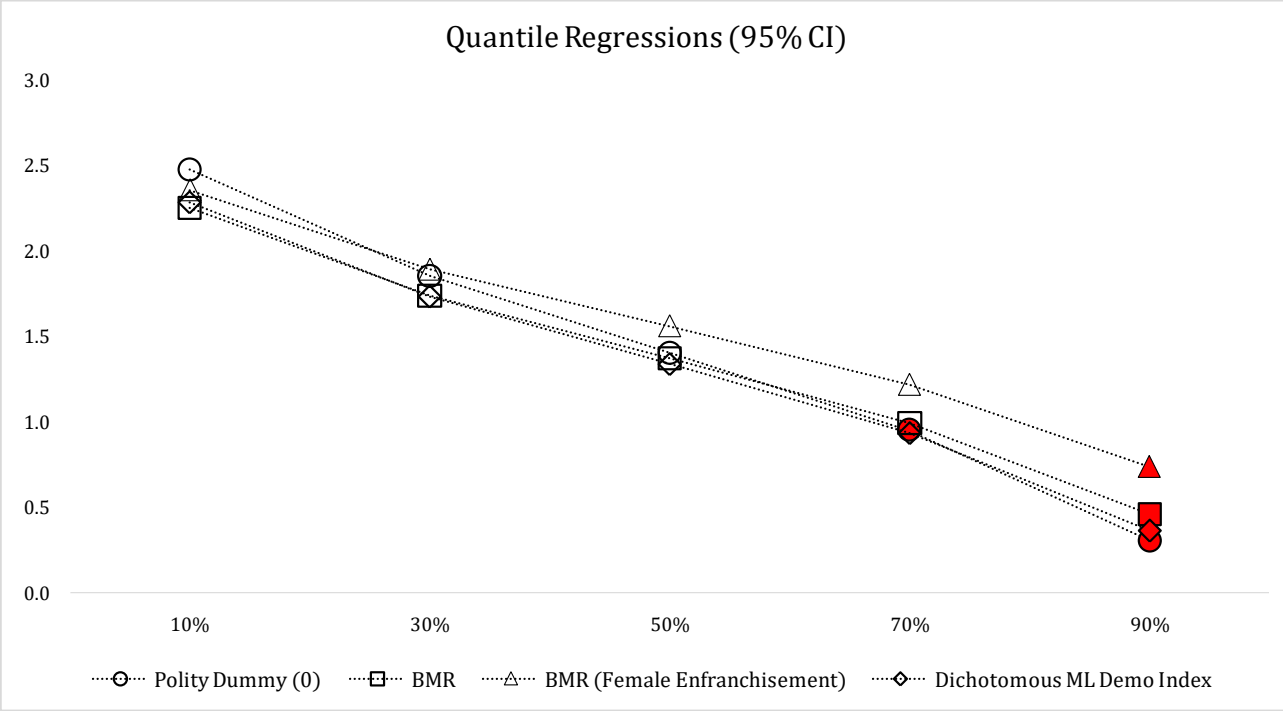




Notes: Results from cohort dataset; the sample contains adult population from 20 to 55 years old taller than 130cm and whose country of response coincides with country of birth. In all regressions we use Country & Year double clustered SEs; *** p<0.01, ** p<0.05, * p<0.1. All plotted regression coefficients are obtained by including regional and age-cohort fixed effects, country controls are included as well. Country controls are: Infant mortality, GDP per capita (log), Healthcare access, Conflict intensity. Definitions and sources provided in Table 1. See also Table 10 for the estimates, and Gründler and Krieger (2021b) for the definitions of the Machine learning indexes.

Figure 4. Quantile Regressions Results





Notes: Results from cohort dataset; the sample contains adult population from 20 to 55 years old taller than 130cm and whose country of response coincides with country of birth. In all regressions we use Country & Year double clustered SEs; *** $p<0.01$, ** $p<0.05$, * $p<0.1$. All plotted regression coefficients are obtained by including regional and age-cohort fixed effects, country controls are included as well. Country controls are: Infant mortality, GDP per capita (log), Healthcare access, Conflict intensity. Definitions and sources provided in Table 1. Figure shows the results from quantile regressions following Machado and Silva (2019). See also Table A8 for the full set of estimates, and Gründler and Krieger (2021b) for the definitions of the Machine learning indexes.

Table 1 - Data Definitions and Descriptive Statistics

Variable	Definition	Obs,	Mean	Std.Dev.	Min	Max
Height	Measure of individual-level stature in cm of the respondent from European Social Survey, 7th wave (ESS7)	19,442	172.2	9.488	130	208
V-dem – Additive	Additive Democracy Index from the VDem Database	17,082	0.785	2.466	0.141	0.973
V-dem – Multiplicative	Multiplicative Democracy Index From the VDem Database	17,082	0.560	3.090	0	0.897
Polity Score	Polity Score From Polity IV Database	16,985	5.572	6.720	-9	10
Polity Dummy	Polity Dummy (Based on Polity Score being below/above the 0 threshold)	16,985	0.807	0.395	0	1
BMR (Dummy)	Democratic dummy From Boix, Miller & Rosato	16,985	0.798	0.401	0	1
Female franchise (BMR dummy)	Democratic dummy from Boix, Miller & Rosato Includes requirement 50% more of female adult population being allowed to vote.	16,985	0.784	0.411	0	1
Communist Dummy	Communist Dummy (=1 if Country is: CZE, EST, HUN, LTU, POL)	19,442	0.236	0.424	0	1
Female Dummy	Female dummy Respondent's gender from ESS7	19,439	0.526	0.499	0	1
Parents' education	Parents' education based on the mother & father average level of education From ESS7	16,401	5.944	3.331	0	14
Infant mortality	Country-Level Infant Mortality From Gapminder	16,920	17.45	10.97	4.400	84.60
GDP per capita (log)	Country-Level GDP per capita From Gapminder	19,442	9.755	0.413	8.605	10.79
Healthcare access	Country-Level: from VDem database	17,082	3.510	0.604	1	4
Conflict intensity	Country-Level: from Armed Conflict Dataset	19,442	0.109	0.326	0	2
Year of birth	Year of birth of respondent from ESS7	19,442	1976	10.30	1959	1995

Table 2 - Baselines Estimates
Effects of Democracy Exposure at Birth on Self-Reported Adult Height

The dependent variable is self-reported height expressed in cm						
Democracy measure used as treatment:	V-Dem Additive	V-Dem Mult.	Polity Score	Polity (Dummy)	BMR (Dummy)	BMR (Dummy) Female Franchise
Regressions Panel (A)	(1)	(2)	(3)	(4)	(5)	(6)
Democracy coef.	0.339***	0.265***	0.121***	2.046***	2.043***	2.023***
	(0.039)	(0.045)	(0.021)	(0.303)	(0.309)	(0.308)
Democracy: *Beta Coeff.*	*[0.786]*	*[0.787]*	*[0.777]*	---	---	---
Female	-11.039***	-11.839***	-12.479***	-11.677***	-11.682***	-11.776***
	(0.576)	(0.350)	(0.258)	(0.432)	(0.409)	(0.391)
Democracy × Female	-0.246***	-0.203***	-0.087***	-1.580***	-1.587***	-1.500***
	(0.063)	(0.051)	(0.026)	(0.432)	(0.408)	(0.407)
Dem + Dem × Fem	0.093	0.062	0.034	0.467	0.457	0.523
Lin.com. (p-val)	*0.043*	*0.227*	*0.078*	*0.165*	*0.123*	*0.084*
Observations	14,381	14,381	14,293	14,293	14,293	14,293
R-squared	0.529	0.529	0.529	0.529	0.529	0.529
Regional dummies	230	230	228	228	228	228
Year/Cohort dummies	37	37	37	37	37	37
Country-Controls	×	×	×	×	×	×
Regressions Panel (B) Country Controls	(7)	(8)	(9)	(10)	(11)	(12)
Democracy	0.240***	0.186***	0.074**	1.399***	1.361***	1.554***
	(0.058)	(0.045)	(0.029)	(0.447)	(0.438)	(0.454)
Democracy : Beta Coeff.	*[0.529]*	*[0.517]*	*[0.441]*	---	---	---
Female	-11.180***	-11.938***	-12.531***	-11.800***	-11.778***	-11.892***
	(0.524)	(0.337)	(0.249)	(0.439)	(0.439)	(0.394)
Democracy × Female	-0.232***	-0.189***	-0.082***	-1.483***	-1.517***	-1.412***
	(0.058)	(0.050)	(0.025)	(0.436)	(0.431)	(0.405)
Dem. + Dem. × Fem	0.008	-0.004	-0.008	-0.084	-0.156	0.142
Lin.com. (p-val)	*0.846*	*0.937*	*0.682*	*0.806*	*0.644*	*0.722*
Observations	13,088	13,088	13,000	13,000	13,000	13,000
R-squared	0.537	0.537	0.537	0.537	0.537	0.537
Regional dummies	230	230	228	228	228	228
Year/Cohort dummies	37	37	37	37	37	37
Country-Controls	✓	✓	✓	✓	✓	✓

Notes: Results from cohort dataset; the sample contains adult population from 20 to 55 years old taller than 130cm and whose country of response coincides with country of birth. In all regressions we use Country & Year double clustered SEs; *** p<0.01, ** p<0.05, * p<0.1. Country controls are: Infant mortality, GDP per capita (log), Healthcare access, Conflict intensity. Definitions and sources provided in Table 1.

Table 3 - Interactions with 10yrs Period-Specific Categorical Variable

The dependent variable is self-reported height expressed in cm						
Democracy measure used as independent variable	V-Dem Additive	V-Dem Multiplicative	Polity Score	Polity (Dummy)	BMR (Dummy)	BMR (Dummy) Female Franchise
Regressions Panel (A)	(1)	(2)	(3)	(4)	(5)	(6)
Democracy coefficient	0.417***	0.366***	0.155***	2.548***	2.532***	2.509***
	(0.045)	(0.041)	(0.021)	(0.305)	(0.325)	(0.374)
Baseline interaction: Democracy × Period 59-68						
Democracy × Period 69-77	-0.077***	-0.085***	-0.027**	-0.410***	-0.402**	-0.513***
	(0.023)	(0.024)	(0.011)	(0.134)	(0.161)	(0.165)
Democracy × Period 78-86	-0.343***	-0.271***	-0.120***	-1.973***	-1.932***	-2.023***
	(0.053)	(0.035)	(0.021)	(0.255)	(0.252)	(0.263)
Democracy × Period 87-95	-0.026	-0.070	0.019	0.076	0.021	-0.063
	(0.043)	(0.047)	(0.013)	(0.321)	(0.380)	(0.385)
Observations	14,098	14,098	14,010	14,010	14,010	14,010
R-squared	0.530	0.530	0.530	0.529	0.529	0.530
Regional dummies	230	230	228	228	228	228
Year/Cohort dummies	36	36	36	36	36	36
Country-Level Controls	×	×	×	×	×	×
Individual-Level Controls	✓	✓	✓	✓	✓	✓
Linear combinations estimates						
Demo + Demo x Year Group 69-77	0.340	0.281	0.128	2.139	2.130	1.996
Pval	*0.000*	*0.000*	*0.100*	*0.034*	*0.000*	*0.000*
Demo + Demo x Year Group 78-86	0.074	0.096	0.035	0.575	0.601	0.486
Pval	*0.126*	*0.034*	*0.000*	*0.000*	*0.000*	*0.000*
Demo + Demo x Year Group 87-95	0.391	0.296	0.174	2.625	2.553	2.446
Pval	*0.000*	*0.000*	*0.000*	*0.000*	*0.032*	*0.088*
Regressions Panel (B) - Country Controls	(7)	(8)	(9)	(10)	(11)	(12)
Democracy	0.347***	0.315***	0.125***	2.127***	2.136***	2.281***
	(0.082)	(0.062)	(0.033)	(0.553)	(0.556)	(0.566)
Baseline interaction: Democracy × Period 59-68						
Democracy × Period 69-77	-0.046**	-0.064**	-0.023**	-0.277**	-0.353***	-0.473***
	(0.021)	(0.023)	(0.008)	(0.102)	(0.121)	(0.163)
Democracy × Period 78-86	-0.355***	-0.284***	-0.128***	-2.118***	-2.143***	-2.278***
	(0.073)	(0.051)	(0.025)	(0.389)	(0.398)	(0.417)
Democracy × Period 87-95	-0.026	-0.081*	0.012	0.015	-0.076	-0.242
	(0.054)	(0.045)	(0.028)	(0.368)	(0.422)	(0.466)
Observations	12,853	12,853	12,765	12,765	12,765	12,765
R-squared	0.537	0.537	0.537	0.537	0.537	0.537
Regional dummies	230	230	228	228	228	228
Year/Cohort dummies	36	36	36	36	36	36
Country-Level Controls	✓	✓	✓	✓	✓	✓
Individual-Level Controls	✓	✓	✓	✓	✓	✓
Linear combinations estimates						
Demo + Demo x Year Group 69-77	0.301	0.251	0.102	1.851	1.784	1.808
Pval	*0.001*	*0.000*	*0.894*	*0.000*	*0.000*	*0.000*
Demo + Demo x Year Group 78-86	-0.008	0.031	-0.003	0.010	-0.006	0.002
Pval	*0.000*	*0.001*	*0.000*	*0.979*	*0.001*	*0.000*
Demo + Demo x Year Group 87-95	0.321	0.234	0.137	2.143	2.060	2.039
Pval	*0.912*	*0.557*	*0.002*	*0.001*	*0.986*	*0.994*

Notes: Results from cohort dataset; the sample contains adult population from 20 to 55 years old taller than 130cm and whose country of response coincides with country of birth. In all regressions we use Country & Year double clustered SEs; *** p<0.01, ** p<0.05, * p<0.1. Country controls are: Infant mortality, GDP per capita (log), Healthcare access, Conflict intensity. Definitions and sources provided in Table 1.

Table 4 - Fully absorbed model with Time-Specific Regional Fixed Effects

The dependent variable is self-reported height expressed in cm						
Democracy measure used as independent variable in each regression:	V-Dem Additive	V-Dem Multiplicative	Polity Index	Polity (Dummy)	BMR (Dummy)	BMR (Dummy) Female Franchise
Regressions Panel (A)	(1)	(2)	(3)	(4)	(5)	(6)
Democracy coefficient	0.283***	0.207***	0.104***	1.709***	1.495***	1.329**
	(0.037)	(0.033)	(0.025)	(0.339)	(0.461)	(0.468)
Demo treatment: Beta Coefficient	*[0.661]*	*[0.619]*	*[0.668]*	---	---	---
Female	-11.161***	-11.936***	-12.535***	-11.825***	-11.814***	-11.936***
	(0.593)	(0.354)	(0.256)	(0.441)	(0.419)	(0.409)
Democracy × Female	-0.235***	-0.192***	-0.083***	-1.445***	-1.471***	-1.347***
	(0.065)	(0.053)	(0.026)	(0.440)	(0.419)	(0.422)
Observations	14,078	14,078	13,990	13,990	13,990	13,990
R-squared	0.547	0.547	0.547	0.547	0.547	0.547
Country Level Controls	×	×	×	×	×	×
Year Specific - Regional dummies	804	804	802	802	802	802
Regressions Panel (B) Country Controls	(7)	(8)	(9)	(10)	(11)	(12)
Democracy coefficient	0.226***	0.175***	0.063*	1.194**	1.043*	0.840
	(0.068)	(0.042)	(0.033)	(0.435)	(0.583)	(0.534)
Demo treatment: Beta Coefficient	*[0.500]*	*[0.489]*	*[0.376]*	---	---	---
Female	-11.328***	-12.055***	-12.601***	-11.976***	-11.942***	-12.094***
	(0.550)	(0.383)	(0.265)	(0.461)	(0.461)	(0.412)
Democracy × Female	-0.219***	-0.176***	-0.078***	-1.325***	-1.372***	-1.220***
	(0.061)	(0.056)	(0.026)	(0.454)	(0.450)	(0.419)
Observations	12,821	12,821	12,733	12,733	12,733	12,733
R-squared	0.556	0.556	0.556	0.556	0.556	0.556
Country Level Controls	✓	✓	✓	✓	✓	✓
Year Specific - Regional dummies	791	791	789	789	789	789

Notes: Results from cohort dataset; the sample contains adult population from 20 to 55 years old taller than 130cm and whose country of response coincides with country of birth. In all regressions we use Country & Year double clustered SEs; *** p<0.01, ** p<0.05, * p<0.1. Country controls are: Infant mortality, GDP per capita (log), Healthcare access, Conflict intensity. Definitions and sources provided in Table 1.

Table 5 - Effects of Democracy on Heights, including when Country of Birth Differs from Countries of Response. (N ≥ 40 threshold used to include additional countries)

The dependent variable is self-reported height expressed in cm						
Democratic Measure used as treatment	V-Dem Additive	V-Dem Multiplicative	Polity Index	Polity (Dummy)	BMR (Dummy)	BMR (Dummy) Female Franchise
Regressions Panel (A)	(1)	(2)	(3)	(4)	(5)	(6)
Democracy coef.	0.362***	0.289***	0.122***	2.211***	2.232***	2.131***
	(0.056)	(0.054)	(0.025)	(0.422)	(0.429)	(0.382)
Democracy: Beta Coefficient	*[0.873]*	*[0.882]*	*[0.806]*	---	---	---
Female	-11.087***	-11.851***	-12.466***	-11.670***	-11.684***	-11.768***
	(0.507)	(0.318)	(0.237)	(0.395)	(0.372)	(0.361)
Democracy × Female	-0.236***	-0.197***	-0.084***	-1.553***	-1.548***	-1.469***
	(0.055)	(0.045)	(0.023)	(0.396)	(0.373)	(0.378)
Observations	15,354	15,354	15,266	15,266	15,266	15,266
R-squared	0.524	0.524	0.524	0.524	0.524	0.524
Regional dummies	230	230	228	228	228	228
Year/Cohort dummies	37	37	37	37	37	37
Country-Controls	×	×	×	×	×	×
Regressions Panel (B) Country Controls	(7)	(8)	(9)	(10)	(11)	(12)
Democracy coef.	0.229***	0.172***	0.067***	1.426***	1.468***	1.479***
	(0.042)	(0.038)	(0.021)	(0.347)	(0.335)	(0.356)
Democracy: Beta Coefficient	*[0.555]*	*[0.522]*	*[0.434]*	---	---	---
Female	-11.316***	-12.032***	-12.564***	-11.826***	-11.820***	-11.914***
	(0.449)	(0.291)	(0.219)	(0.384)	(0.379)	(0.348)
Democracy × Female	-0.214***	-0.173***	-0.076***	-1.444***	-1.459***	-1.374***
	(0.050)	(0.043)	(0.022)	(0.388)	(0.378)	(0.365)
Observations	13,956	13,956	13,868	13,868	13,868	13,868
R-squared	0.532	0.532	0.532	0.532	0.532	0.532
Regional dummies	230	230	228	228	228	228
Year/Cohort dummies	37	37	37	37	37	37
Country-Controls	✓	✓	✓	✓	✓	✓

Notes: Results from cohort dataset; the sample contains adult population from 20 to 55 years old taller than 130cm and whose country of response coincides with country of birth. In all regressions we use Country & Year double clustered SEs; *** p<0.01, ** p<0.05, * p<0.1. Country controls are: Infant mortality, GDP per capita (log), Healthcare access, Conflict intensity. Definitions and sources provided in Table 1. Country of response does not coincide necessarily with country of birth as in the previous tables; when it does not, we select only respondents from birth countries with more than 40 observations.

Table 6 – Effects of Democracy on Heights
Omission the Former Communist Countries in the Sample

The dependent variable is self-reported height expressed in cm						
Democracy Treatments are:	V-Dem Additive	V-Dem Multiplicative	Polity Index	Polity (Dummy)	BMR (Dummy)	BMR (Dummy) Female Franchise
Regressions Include Country Controls	(1)	(2)	(3)	(4)	(5)	(6)
Democracy coef.	0.225**	0.199**	0.081*	1.762***	1.644**	1.908***
	(0.095)	(0.074)	(0.042)	(0.593)	(0.580)	(0.513)
Demo treatment: Beta Coeff.	*[0.420]*	*[0.441]*	*[0.376]*	---	---	---
Female	-11.410***	-11.966***	-12.540***	-11.691***	-11.682***	-11.958***
	(0.506)	(0.365)	(0.267)	(0.403)	(0.461)	(0.396)
Democracy × Female	-0.206***	-0.183***	-0.081***	-1.591***	-1.607***	-1.338***
	(0.057)	(0.057)	(0.027)	(0.389)	(0.445)	(0.430)
Observations	11,527	11,527	11,489	11,489	11,489	11,489
R-squared	0.541	0.541	0.541	0.541	0.541	0.541
Regional dummies	185	185	184	184	184	184
Year/Cohort dummies	37	37	37	37	37	37
Country Controls	✓	✓	✓	✓	✓	✓

Notes: Results from cohort dataset; the sample contains adult population from 20 to 55 years old taller than 130cm and whose country of response coincides with country of birth. In all regressions we use Country & Year double clustered SEs; *** p<0.01, ** p<0.05, * p<0.1. Country controls are: Infant mortality, GDP per capita (log), Healthcare access, Conflict intensity. Definitions and sources provided in Table 1. The former communist countries excluded are: Czech Republic, Estonia, Hungary, Lithuania, Poland.

Table 7– Communism Exposure

The dependent variable is self-reported height expressed in cm				
Democracy Measure used as Independent variable	Same birth and response country		Country of birth included when different from country of response (N >= 40)	
Regressions	(1)	(2)	(3)	(4)
Communist dummy	-1.161***	-1.325**	-1.077***	-1.189**
	(0.100)	(0.560)	(0.328)	(0.442)
Female	-13.142***	-13.199***	-13.099***	-13.189***
	(0.140)	(0.144)	(0.124)	(0.118)
Communist x Female	0.797	1.176*	0.796	1.217**
	(0.548)	(0.617)	(0.488)	(0.533)
Observations	16,398	13,088	17,540	13,956
R-squared	0.526	0.537	0.520	0.532
Regional dummies	231	230	231	230
Year/Cohort dummies	37	37	37	37
Country Controls	×	✓	×	✓

Notes: Results from cohort dataset; the sample contains adult population from 20 to 55 years old taller than 130cm and whose country of response coincides with country of birth. In all regressions we use Country & Year double clustered SEs; *** p<0.01, ** p<0.05, * p<0.1. Country controls are: Infant mortality, GDP per capita (log), Healthcare access, Conflict intensity. Definitions and sources provided in Table 1. The former communist countries excluded are: Czech Republic, Estonia, Hungary, Lithuania, Poland.

Table 8 – Adding the Machine Learning Indices and Wald Tests

The dependent variable is self-reported height expressed in cm								
Democracy measure utilized as independent variable:	ML Index Continuous	V-Dem Add. Index	V-Dem Mult. Index	Polity Score (Norm. 0 to 1)	ML Index Dichotomous	BMR	BMR Fem. Fanch.	Polity (0-threshold)
	Group 1: Indexes (0 to 1)				*Group 2: Democracy Dummies*			
Regressions	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Democracy Coeff.	1.471***	2.404***	1.856***	1.480**	1.329***	1.361***	1.554***	1.399***
	(0.471)	(0.579)	(0.450)	(0.577)	(0.444)	(0.438)	(0.454)	(0.447)
Female	-11.783***	-11.180***	-11.938***	-11.708***	-11.799***	-11.778***	-11.892***	-11.800***
	(0.438)	(0.524)	(0.337)	(0.474)	(0.439)	(0.439)	(0.394)	(0.439)
Democracy × Female	-1.551***	-2.321***	-1.894***	-1.647***	-1.492***	-1.517***	-1.412***	-1.483***
	(0.449)	(0.579)	(0.500)	(0.497)	(0.432)	(0.431)	(0.405)	(0.436)
Parental Education	0.198***	0.196***	0.197***	0.198***	0.197***	0.197***	0.198***	0.197***
	(0.034)	(0.035)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.035)
Observations	13,020	13,088	13,088	13,000	13,020	13,000	13,000	13,000
R-squared	0.537	0.537	0.537	0.537	0.537	0.537	0.537	0.537
Regional FE	229	230	230	228	229	228	228	228
Year (Age-cohort) FE	37	37	37	37	37	37	37	37
Country-Level Controls	✓	✓	✓	✓	✓	✓	✓	✓
Wald (p-value)	Comp. coef.	0.057	0.398	0.983	Comp. coef.	0.282	0.233	0.453
Demo. + Demo. × Female Joint Coefficient	-0.080	0.083	-0.037	-0.167	-0.162	-0.156	0.142	-0.084
p-value of the joint coeff.	0.838	0.846	0.937	0.682	0.643	0.644	0.722	0.806

Notes: Results from cohort dataset; the sample contains adult population from 20 to 55 years old taller than 130cm and whose country of response coincides with country of birth. In all regressions we use Country & Year double clustered SEs; *** p<0.01, ** p<0.05, * p<0.1. Country controls are: Infant mortality, GDP per capita (log), Healthcare access, Conflict intensity. Definitions and sources provided in Table 1. For more information about the Continuous and Dichotomic Democracy ML Indexes, please see Gründler and Krieger (2021b). See also Figure 2, reporting the main coefficients of interest.

Table 9 – Difference Childhood-Adolescence

The dependent variable is self-reported height expressed in cm								
Democracy measure as independent variable:	Polity Score (Norm 0 to 1)	Polity dummy	BMR Dummy	BMR Female Enfranchisement	V-Dem Additive Index	V-Dem Multiplicative Index	Continuous ML Demo Index	Dichotomous ML Index
All regressions include country-level controls	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Democracy coefficient	0.128***	2.488***	2.247***	2.397***	3.962***	3.062***	2.520***	2.243***
	(0.042)	(0.522)	(0.568)	(0.581)	(0.817)	(0.572)	(0.590)	(0.596)
Childhood to Adolescence Δ Democracy score	0.065**	1.417***	1.168**	1.024*	1.868**	1.348**	1.296**	1.184**
	(0.030)	(0.343)	(0.491)	(0.516)	(0.716)	(0.525)	(0.458)	(0.493)
Female respondent	-12.480***	-11.683***	-11.680***	-11.807***	-11.009***	-11.853***	-11.679***	-11.699***
	(0.250)	(0.438)	(0.430)	(0.387)	(0.516)	(0.330)	(0.432)	(0.431)
Democracy × Female	-0.088***	-1.600***	-1.616***	-1.497***	-2.508***	-2.005***	-1.658***	-1.591***
	(0.026)	(0.442)	(0.427)	(0.413)	(0.577)	(0.504)	(0.448)	(0.430)
Parents' Education	0.199***	0.198***	0.198***	0.199***	0.198***	0.198***	0.198***	0.198***
	(0.035)	(0.035)	(0.035)	(0.034)	(0.035)	(0.035)	(0.035)	(0.035)
Observations	13,000	13,000	13,000	13,000	13,088	13,088	13,020	13,020
R-squared	0.537	0.537	0.537	0.537	0.537	0.537	0.537	0.537
Regional FE	228	228	228	228	230	230	229	229
Year FE (1959-1995)	37	37	37	37	37	37	37	37
Country-Level Controls	✓	✓	✓	✓	✓	✓	✓	✓

Notes: Results from cohort dataset; the sample contains adult population from 20 to 55 years old taller than 130cm and whose country of response coincides with country of birth. In all regressions we use Country & Year double clustered SEs; *** p<0.01, ** p<0.05, * p<0.1. Country controls are: Infant mortality, GDP per capita (log), Healthcare access, Conflict intensity. Definitions and sources provided in Table 1. For more information about the Continuous and Dichotomic Democracy ML Indexes, please see Gründler and Krieger (2021b). For male population we calculated the difference between the democracy score at birth and an average of the democratic score between 12 and 16 years old. For female the same difference, but between 10 and 14 years old. See Figure A5, showing the different peaks for male and female population. A distribution of these differences for each of the eight democratic measures is presented in Figure A6 in the Appendix section of the paper.

Table 10 – Democratic Capital

V-Dem Additive Index	V-Dem Multiplicative Index	Polity 2 Score (Norm 0 to 1)	Continuous ML Demo Index	Polity 2 Dummy (0 threshold)	BMR Dummy	BMR Dummy (Female Voting)	Dichotomous ML Demo Index
			Moving Average (t-1, t, t+1)				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2.224***	1.647***	0.066**	1.489***	1.262**	1.285**	1.593***	1.384**
(0.602)	(0.543)	(0.030)	(0.506)	(0.460)	(0.530)	(0.535)	(0.516)
(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
			Moving Average (t-5, t, t+5)				
2.570***	1.952**	0.083**	1.764**	1.614***	1.692***	1.992***	1.627**
(0.747)	(0.723)	(0.035)	(0.619)	(0.562)	(0.564)	(0.581)	(0.607)
(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
			Moving Average (t-10, t, t+10)				
3.137***	2.413**	0.117**	2.434***	2.325***	*2.370****	2.666***	2.298***
(0.867)	(0.886)	(0.041)	(0.729)	(0.655)	(0.630)	(0.614)	(0.691)
(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
			Moving Average (t-15, t, t+15)				
4.535***	3.779***	0.170***	3.643***	3.557***	3.400***	3.567***	3.375***
(0.946)	(0.942)	(0.051)	(0.799)	(0.735)	(0.669)	(0.628)	(0.781)
(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)
			Moving Average (t-20, t, t+20)				
5.562***	4.872***	0.203***	4.431***	4.154***	4.138***	4.178***	3.995***
(1.061)	(1.135)	(0.064)	(0.901)	(0.884)	(0.777)	(0.676)	(0.881)

Notes: Results from cohort dataset; the sample contains adult population from 20 to 55 years old taller than 130cm and whose country of response coincides with country of birth. In all regressions we use Country & Year double clustered SEs; *** p<0.01, ** p<0.05, * p<0.1. Country controls are: Infant mortality, GDP per capita (log), Healthcare access, Conflict intensity. Definitions and sources provided in Table 1. For more information about the Continuous and Dichotomic Democracy ML Indexes, please see Gründler and Krieger (2021b). All results report only the coefficients of interest, obtained including the country controls. See also Figure 3 and Table A7, reporting the results including only moving averages before (but not after) the year of birth.

Appendix Tables - For Online Publication

Table A0 - Observations by Country of Birth Breakdown

Country of birth	Observations	Height in cm	Country	Observations	Height in cm
Austria	917	172.62	United Kingdom	1058	169.67
Belgium	859	172.48	Hungary (C)	901	171.14
Switzerland	642	172.63	Ireland	1035	170.82
Czech Republic (C)	1249	172.88	Israel	1147	169.25
Germany	1425	173.94	Lithuania (C)	1117	172.59
Denmark	758	175.20	Netherlands	883	175.33
Spain	1008	169.68	Norway	746	174.87
Estonia (C)	993	173.08	Poland (C)	913	171.22
Finland	934	172.80	Portugal	531	167.01
France	931	170.53	Slovenia	596	172.18
			Sweden	812	174.33

Source: ESS7: Countries, observations, and average heights in baseline sample. Sample for whom country of birth is the same than country of response.

Table A1 - Additional tables with descriptive statistics

Country of birth of respondent	20 to 55 years old		Whole Sample		20-55 sample (% of whole sample)
	Freq.	Percent	Freq.	Percent	
Austria	1,059	4.85	1,786	4.49	59.29%
Belgium	1,025	4.69	1,768	4.45	57.98%
Switzerland	887	4.06	1,531	3.85	57.94%
Czech Republic (C)	1,275	5.84	2,103	5.29	60.63%
Germany	1,618	7.41	3,028	7.62	53.43%
Denmark	833	3.81	1,497	3.77	55.64%
Spain	1,139	5.21	1,888	4.75	60.33%
Estonia (C)	1,090	4.99	2,039	5.13	53.46%
Finland	1,011	4.63	2,076	5.22	48.70%
France	1,055	4.83	1,910	4.8	55.24%
United Kingdom	1,170	5.36	2,237	5.63	52.30%
Hungary (C)	914	4.18	1,683	4.23	54.31%
Ireland	1,277	5.85	2,275	5.72	56.13%
Israel	1,415	6.48	2,535	6.38	55.82%
Lithuania (C)	1,147	5.25	2,202	5.54	52.09%
Netherlands	997	4.56	1,917	4.82	52.01%
Norway	823	3.77	1,431	3.6	57.51%
Poland (C)	916	4.19	1,612	4.06	56.82%
Portugal	601	2.75	1,240	3.12	48.47%
Slovenia	639	2.93	1,204	3.03	53.07%
Sweden	955	4.37	1,789	4.5	53.38%
Total	21,846	100	39,751	100	54.96%

Source: ESS7: Countries, observations, and average heights in baseline sample. Sample for whom country of birth is the same than country of response.

Table A2 - Male and Female Heights in cm

Country of birth of respondent	(1) Male height full sample	(2) Male height 20 - 55 years	(3) Female height full sample	(4) Female height 20 - 55 years	(5) diff 1 -3	(6) diff 2 – 4
Austria	175.94	179.02	163.84	166.51	12.10	12.51
Belgium	174.69	178.25	163.25	165.98	11.44	12.27
Switzerland	175.41	178.58	163.55	165.58	11.86	12.99
Czech Republic (C)	174.56	179.12	165.25	167.73	9.31	11.39
Germany	176.87	179.98	163.82	166.98	13.05	13.00
Denmark	178.75	181.28	165.54	167.91	13.20	13.36
Spain	170.72	175.74	158.97	162.63	11.75	13.11
Estonia (C)	176.09	180.50	162.14	166.39	13.95	14.12
Finland	176.43	179.45	162.87	165.79	13.57	13.66
France	173.64	176.87	160.70	164.43	12.94	12.45
United Kingdom	175.79	176.93	161.18	163.79	14.61	13.14
Hungary (C)	173.02	177.55	162.81	165.99	10.20	11.56
Ireland	175.94	178.11	162.70	165.40	13.24	12.71
Israel	172.57	176.12	160.68	163.47	11.89	12.64
Lithuania (C)	175.32	179.79	164.02	167.54	11.30	12.25
Netherlands	177.99	182.54	166.83	169.37	11.16	13.18
Norway	178.89	181.13	165.53	167.38	13.35	13.74
Poland (C)	173.40	177.90	161.81	164.85	11.60	13.05
Portugal	168.91	173.38	158.12	161.62	10.79	11.77
Slovenia	175.22	179.03	163.79	166.60	11.44	12.43
Sweden	178.47	180.59	164.91	166.86	13.57	13.73

Source: ESS7: Countries, observations, and average heights in baseline sample. Sample for whom country of birth is the same than country of response.

Table A3 - ESS7

Adults between 20 and 55 Years Old: Average Height and Observations Breakdown According to Country of Birth

country of birth	obs	height	country of birth	obs	height	country of birth	obs	height	country of birth	obs	height
AFG	15	166.13	ECU	13	162.15	KAZ	27	170.67	PRI	1	165.00
AGO	18	171.06	EGY	2	181.00	KEN	7	167.19	PRT	579	167.13
ALB	3	159.00	ERI	6	172.33	KGZ	2	176.00	PRY	3	164.00
ARG	16	169.88	ESP	1021	169.67	KOR	9	169.67	PSE	1	168.00
ARM	12	170.33	EST	1008	173.02	KWT	2	180.00	REU	1	160.00
ASM	1	200.00	ETH	25	165.60	LAO	2	162.50	*ROU*	*67*	*170.49*
AUS	6	167.17	FIN	944	172.78	LBN	12	169.92	RUS	203	169.47
AUT	931	172.57	FRA	995	170.64	LBR	1	175.00	RWA	4	176.00
AZE	5	162.60	FRO	2	180.00	LBY	3	159.33	SAU	1	183.00
BDI	1	168.00	GAB	2	166.50	LIE	1	178.00	SDN	5	173.00
BEL	871	172.45	GBR	1161	169.76	LKA	10	159.45	SEN	5	170.60
BEN	2	169.50	GEO	14	167.64	LTU	1144	172.58	SGP	1	174.00
BFA	2	169.50	GHA	5	172.00	LUX	2	180.00	SLE	2	167.00
BGD	4	167.50	GIN	2	175.00	LVA	19	172.84	SOM	15	168.33
BGR	21	171.38	GMB	4	171.50	*MAR*	*67*	*170.97*	*SRB*	*38*	*172.55*
BIH	*78*	*174.59*	GNB	8	168.75	MDA	7	173.71	STP	3	168.67
BLR	22	170.23	GNQ	3	168.33	MDG	3	160.67	SUR	8	166.50
BOL	5	158.40	GRC	6	168.33	MEX	9	167.22	SVK	20	172.35
BRA	*39*	*168.10*	GRD	1	178.00	MKD	12	172.00	SVN	599	172.18
CAF	1	172.00	GRL	1	160.00	MLI	2	167.00	SWE	853	174.37
CAN	6	170.50	GTM	2	163.00	MNE	1	169.00	SYR	6	165.83
CHE	649	172.70	GUF	1	169.00	MNG	1	168.00	TCD	1	176.00
CHL	9	172.00	HKG	2	161.00	MOZ	5	166.40	THA	14	162.71
CHN	28	168.10	HND	2	170.00	MRT	2	168.50	TJK	2	169.00
CIV	6	169.67	HRV	34	173.47	MTQ	3	184.33	TUN	14	169.71
CMR	2	181.50	HUN	912	171.10	MUS	2	174.00	*TUR*	*83*	*172.05*
COD	13	172.38	IDN	5	164.80	MYS	3	170.67	TZA	2	159.00
COG	5	173.00	*IND*	*43*	*167.75*	NER	1	172.00	UGA	2	166.00
COL	13	163.46	IRL	1045	170.82	NGA	12	167.92	*UKR*	*81*	*171.84*
COM	2	160.00	*IRN*	*37*	*166.30*	NIC	1	159.00	URY	1	170.00
CPV	5	164.80	IRQ	29	169.69	NLD	913	175.29	*USA*	*43*	*171.98*
CRI	2	170.00	ISL	4	179.00	NOR	752	174.85	UZB	17	170.12
CUB	7	169.57	ISR	1151	169.28	NPL	5	168.20	VEN	12	168.50
CZE	1257	172.87	*ITA*	*43*	*171.19*	NZL	2	170.50	VNM	7	160.57
DEU	1536	173.86	JAM	1	162.56	PAK	25	167.73	YEM	1	170.00
DNK	769	175.19	JOR	1	187.00	PER	12	159.83	ZAF	21	170.70
DOM	6	165.00	JPN	4	165.50	PHL	15	160.53	ZMB	5	176.40
DZA	26	167.85				POL	1084	171.42	ZWE	12	167.69

Table A4 - ESS7: Regional Clusters (NUTS 1, 2 or 3) in Sample

ISO	REG	REGION	HEI
AUT	AT11	Burgenland	174.16
AUT	AT12	Niederosterreich	172.34
AUT	AT13	Wien	173.02
AUT	AT21	Karnten	172.90
AUT	AT22	Steiermark	172.35
AUT	AT31	Oberosterreich	173.03
AUT	AT32	Salzburg	171.88
AUT	AT33	Tirol	173.25
AUT	AT34	Vorarlberg	171.65
BEL	BE10	Region de Bruxelles Capitale	173.02
BEL	BE21	Antwerpen	173.33
BEL	BE22	Limburg	173.11
BEL	BE23	Oost Vlaanderen	172.98
BEL	BE24	Vlaams Brabant	173.72
BEL	BE25	West Vlaanderen	172.91
BEL	BE31	Brabant Wallon	172.29
BEL	BE32	Hainaut	170.39
BEL	BE33	Liege	172.22
BEL	BE34	Luxembourg	172.50
BEL	BE35	Namur	170.08
CHE	CH01	Region lemanique	173.79
CHE	CH02	Espace Mittelland	172.68
CHE	CH03	Nordwestschweiz	173.15
CHE	CH04	Zurich	173.05
CHE	CH05	Ostschweiz	171.47
CHE	CH06	Zentralschweiz	172.03
CHE	CH07	Ticino	172.04
DEU	DEA	Nordrhein Westfalen	174.53
DEU	DEB	Rheinland Pfalz	175.62
DEU	DEC	Saarland	172.82
DEU	DED	Sachsen	172.97
DEU	DEE	Sachsen Anhalt	171.77
DEU	DEF	Schleswig Holstein	173.54
DEU	DEG	Thuringen	174.61
DNK	DK01	Hovedstaden	176.35
DNK	DK02	Sjælland	174.33
DNK	DK03	Syddanmark	173.01
DNK	DK04	Midjylland	176.33
DNK	DK05	Nordjylland	175.47
ESP	ES11	Galicia	168.16
ESP	ES12	Principado de Asturias	170.54
ESP	ES13	Cantabria	168.90
ESP	ES21	Pais Vasco	171.36
ESP	ES22	Comunidad Foral de Navarra	168.36
ESP	ES23	La Rioja	165.10
ESP	ES24	Aragon	171.06
ESP	ES30	Comunidad de Madrid	168.75
ESP	ES41	Castilla y Leon	170.23
ESP	ES42	Castilla La Mancha	169.27
ESP	ES43	Extremadura	168.62
ESP	ES51	Cataluna	170.84
ESP	ES52	Comunidad Valenciana	170.28
ESP	ES53	Islas Baleares	169.05
ESP	ES61	Andalucia	169.35
FIN	FI1D4	Kainuu	172.46
FIN	FI1D5	Keski Pohjanmaa	174.38
FIN	FI1D6	Pohjois Pohjanmaa	171.67
FIN	FI1D7	Lappi	171.58
FIN	FI200	Aland	175.75
FRA	FR10	Ile de France	172.72
FRA	FR21	Champagne Ardenne	171.57
FRA	FR22	Picardie	171.82
FRA	FR23	Haute Normandie	169.87
FRA	FR24	Centre	170.03
FRA	FR25	Basse Normandie	167.53
FRA	FR26	Bourgogne	170.71
FRA	FR30	Nord Pas de Calais	171.98
FRA	FR41	Lorraine	171.30
FRA	FR42	Alsace	170.70
FRA	FR43	Franche Comte	174.10
FRA	FR51	Pays de la Loire	169.27
FRA	FR52	Bretagne	169.93
FRA	FR53	Poitou Charentes	164.75
FRA	FR61	Acquitaine	170.42
FRA	FR62	Midi Pyrenees	171.02
FRA	FR63	Limousin	165.56
FRA	FR71	Rhone Alpes	171.76
FRA	FR72	Auvergne	172.33
FRA	FR81	Languedoc Roussillon	170.19
FRA	FR82	Provence Alpes Cote d'Azur	169.74
GBR	UKC	North East	168.81
HUN	HU312	Heves	169.18
HUN	HU313	Nograd	168.42
HUN	HU321	Hajdu Bihar	171.41
HUN	HU322	Jasz Nagykun Szolnok	172.04
HUN	HU323	Szabolcs Szatmar Bereg	169.42
HUN	HU331	Bacs Kiskun	168.78
HUN	HU332	Bekes	172.23
HUN	HU333	Csongrad	172.70
IRL	IE011	Border	171.13
IRL	IE012	idland	171.19
IRL	IE013	West	171.86
IRL	IE021	Dublin	170.33
IRL	IE022	Mid East	172.25
IRL	IE023	Mid West	170.21
IRL	IE024	South East (IRL)	170.62
IRL	IE025	South West (IRL)	169.43
ISR	IL	Israel	169.25
LTU	LT001	Alytaus apskritis	174.02
LTU	LT002	Kauno apskritis	172.76
LTU	LT003	Klaipedos apskritis	173.22
LTU	LT004	Marijampoles apskritis	170.38
LTU	LT005	Panevezio apskritis	174.58
LTU	LT006	Siauliu apskritis	174.05
LTU	LT007	Taurages apskritis	170.67
LTU	LT008	Telsiu apskritis	170.80
LTU	LT009	Utenos apskritis	170.07
LTU	LT00A	Vilniaus apskritis	172.18
POL	PL31	Lubelskie	170.98
POL	PL32	Podkarpackie	171.33
POL	PL33	Swietokrzyskie	169.46
POL	PL34	Podlaskie	171.33
POL	PL41	Wielkopolskie	171.39
POL	PL42	Zachodniopomorskie	169.21
POL	PL43	Lubuskie	170.04
POL	PL51	Dolnoslaskie	171.43
POL	PL52	Opolskie	169.95
POL	PL61	Kujawsko Pomorskie	173.47
POL	PL62	Warminsko Mazurskie	167.50
POL	PL63	Pomorskie	170.84
PRT	PT11	Norte	166.58
PRT	PT15	Algarve	168.62
PRT	PT16	Centro	166.32
PRT	PT17	Lisboa	168.51
PRT	PT18	Alentejo	166.88
SVN	SI011	Pomurska	170.67
SVN	SI012	Podravska	170.26
SVN	SI013	Koroska	173.48
SVN	SI014	Savinjska	172.44
SVN	SI015	Zasavska	171.22
SVN	SI016	Spodnjeposavska	170.52
SVN	SI017	Jugovzhodna Slovenija	170.73
SVN	SI018	Notranjsko kraska	172.30
SVN	SI021	Osrednjeslovenska	172.65
SVN	SI022	Gorenjska	174.48

ISO	REG	REGION	HEI	ISO	REG	REGION	HEI	ISO	REG	REGION	HEI	ISO	REG	REGION	HEI	ISO	REG	REGION	HEI
CZE	CZ010	Hlavni mesto Praha	174.12	ESP	ES62	Region de Murcia	168.37	GBR	UKD	North West	170.29	NLD	NL11	Groningen	175.54	SVN	SI023	Goriska	173.68
CZE	CZ020	Stredocesky kraj	173.50	ESP	ES63	Ciudad Autonoma de Ceuta	180.67	GBR	UKE	Yorkshire and the Humber	169.75	NLD	NL12	Friesland (NL)	175.22	SVN	SI024	Obalno kraska	176.76
CZE	CZ031	Jihocesky kraj	172.79	ESP	ES64	Ciudad Autonoma de Melilla	168.50	GBR	UKF	East Midlands	170.45	NLD	NL13	Drenthe	176.79	SWE	SE110	Stockholms lan	173.96
CZE	CZ032	Plzensky kraj	170.50	ESP	ES70	Canarias	170.96	GBR	UKG	West Midlands	168.04	NLD	NL21	Overijssel	176.68	SWE	SE121	Uppsala lan	173.81
CZE	CZ041	Karlovarsky kraj	172.12	EST	EE001	Pohja Eesti	173.06	GBR	UKH	East of England	169.92	NLD	NL22	Gelderland	176.01	SWE	SE122	Sodermanlands lan	175.12
CZE	CZ042	Ustecky kraj	172.23	EST	EE004	Laane Eesti	174.95	GBR	UKI	London	171.25	NLD	NL23	Flevoland	178.56	SWE	SE123	ostergotlands lan	177.31
CZE	CZ051	Liberecky kraj	172.43	EST	EE006	Kesk Eesti	171.81	GBR	UKJ	South East	170.81	NLD	NL31	Utrecht	175.67	SWE	SE124	orebro lan	177.48
CZE	CZ052	Kralovehradecky kraj	172.05	EST	EE007	Kirde Eesti	172.05	GBR	UKK	South West	169.50	NLD	NL32	Noord Holland	174.76	SWE	SE125	Vastmanlands lan	176.54
CZE	CZ053	Pardubicky kraj	171.65	EST	EE008	Louna Eesti	173.48	GBR	UKL	Wales	169.11	NLD	NL33	Zuid Holland	174.78	SWE	SE211	Jonkopings lan	176.09
CZE	CZ063	Vysocina	172.95	FIN	FI193	Keski Suomi	172.93	GBR	UKM	Scotland	170.97	NLD	NL34	Zeeland	174.41	SWE	SE212	Kronobergs lan	168.23
CZE	CZ064	Jihomoravsky kraj	174.23	FIN	FI194	Etela Pohjanmaa	173.48	GBR	UKN	Northern Ireland	170.59	NLD	NL41	Noord Brabant	175.63	SWE	SE213	Kalmar lan	173.00
CZE	CZ071	Olomoucky kraj	171.62	FIN	FI195	Pohjanmaa	175.00	HUN	HU101	Budapest	171.96	NLD	NL42	Limburg (NL)	172.83	SWE	SE214	Gotlands lan	178.75
CZE	CZ072	Zlinsky kraj	171.74	FIN	FI196	Satakunta	173.59	HUN	HU102	Pest	171.74	NOR	NO01	Oslo og Akershus	175.23	SWE	SE221	Blekinge lan	176.22
CZE	CZ080	Moravskoslezsky kraj	173.56	FIN	FI197	Pirkanmaa	173.68	HUN	HU211	Fejer	173.67	NOR	NO02	Hedmark og Oppland	175.51	SWE	SE224	Skåne lan	175.45
DEU	DE1	Baden Wurttemberg	174.09	FIN	FI1B1	Helsinki Uusimaa	173.19	HUN	HU212	Komarom Esztergom	167.00	NOR	NO03	Sor ostlandet	175.20	SWE	SE231	Hallands lan	174.18
DEU	DE2	Bayern	173.76	FIN	FI1C1	Varsinais Suomi	170.96	HUN	HU213	Veszprem	173.00	NOR	NO04	Agder og Rogaland	176.00	SWE	SE232	Vastra Gotalands lan	174.64
DEU	DE3	Berlin	171.85	FIN	FI1C2	Kanta Hame	171.38	HUN	HU221	Gyor Moson Sopron	171.22	NOR	NO05	Vestlandet	174.73	SWE	SE311	Varmlands lan	174.31
DEU	DE4	Brandenburg	173.73	FIN	FI1C3	Paijat Hame	171.86	HUN	HU222	Vas	168.95	NOR	NO06	Trondelag	174.20	SWE	SE312	Dalarnas lan	170.90
DEU	DE5	Bremen	183.13	FIN	FI1C4	Kymenlaakso	172.88	HUN	HU223	Zala	171.18	NOR	NO07	Nord Norge	171.95	SWE	SE313	Gavleborgs lan	175.62
DEU	DE6	Hamburg	174.27	FIN	FI1C5	Etela Karjala	174.22	HUN	HU231	Baranya	169.88	POL	PL11	Lodzkie	171.18	SWE	SE321	Vasternorrlands lan	176.22
DEU	DE7	Hessen	173.00	FIN	FI1D1	Etela Savo	172.75	HUN	HU232	Somogy	172.00	POL	PL12	Mazowieckie	172.13	SWE	SE322	Jamtlands lan	174.28
DEU	DE8	Mecklenburg Vorpommern	175.38	FIN	FI1D2	Pohjois Savo	171.90	HUN	HU233	Tolna	171.28	POL	PL21	Malopolskie	172.49	SWE	SE331	Vasterbottens lan	173.32
DEU	DE9	Niedersachsen	175.32	FIN	FI1D3	Pohjois Karjala	174.52	HUN	HU311	Borsod Abauj Zemplen	170.24	POL	PL22	Slaskie	170.40	SWE	SE332	Norrbottens lan	171.18

Table A5 - Results using Eurobarometer Survey #64.3

	The dependent variable is self-reported height expressed in cm					
	(1)	(2)	(3)	(4)	(5)	(6)
Democratic treatment is	V-Dem Additive	V-Dem Multiplicative	Polity Index	Polity (Dummy)	BMR (Dummy)	BMR (Dummy) Female Franchise
Democracy coeff.	0.2405***	0.2637***	0.080***	1.189***	1.386***	1.354***
	(0.634)	(0.673)	(0.027)	(0.365)	(0.336)	(0.351)
Female	-10.039***	-11.004***	-11.770***	-10.870***	-10.891***	-10.905***
	(0.367)	(0.236)	(0.166)	(0.233)	(0.221)	(0.218)
Family Background	-0.481*	-0.485*	-0.487*	-0.491*	-0.490*	-0.490*
	(0.259)	(0.261)	(0.255)	(0.256)	(0.257)	(0.257)
Democracy × Female	-3.072***	-2.716***	-0.112***	-1.955***	-1.961***	-1.946***
	(0.493)	(0.422)	(0.018)	(0.300)	(0.276)	(0.275)
Infant mortality	-0.012	-0.013	-0.012	-0.013	-0.011	-0.011
	(0.011)	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)
GDP per capita (Log)	3.069***	2.767**	3.144***	3.270***	3.246***	3.229***
	(1.007)	(1.107)	(1.004)	(0.997)	(0.943)	(0.957)
Observations	11,048	11,048	11,161	11,161	11,180	11,180
R-squared	0.518	0.519	0.518	0.518	0.518	0.518
Year of birth FE	✓	✓	✓	✓	✓	✓
Region FE	✓	✓	✓	✓	✓	✓

Note: The table is from Eurobarometer 64.3. We selected people 20 to 55 years (height stability) old, and for heights greater than cm 130. All regressions contain the year of birth and NUTS regional fixed effects. Robust standard errors are in parenthesis (*** p<0.01, ** p<0.05, * p<0.1). Country controls are: Infant mortality, GDP per capita (log), Healthcare access, Conflict intensity. Definitions and sources provided in Table 1.

Table A6 - Results Using the European Health Interview Survey (EHIS) 1st Wave

The dependent variable is self-reported height expressed in cm						
Regressions	(1)	(2)	(3)	(4)	(5)	(6)
Democratic measure used as independent variable is	V-Dem Additive	V-Dem Multiplicative	Polity Index	Polity (Dummy)	BMR (Dummy)	BMR (Dummy) Female Franchise
Democracy coeff.	0.3065***	0.2422***	0.142***	2.130***	2.019***	2.019***
	(0.429)	(0.371)	(0.017)	(0.267)	(0.260)	(0.260)
Female	-11.911***	-12.137***	-12.407***	-12.174***	-12.174***	-12.174***
	(0.119)	(0.067)	(0.059)	(0.068)	(0.068)	(0.068)
Democracy × Female	-0.747***	-0.730***	-0.035***	-0.533***	-0.412***	-0.412***
	(0.207)	(0.174)	(0.007)	(0.125)	(0.124)	(0.124)
Infant Mortality	-0.018**	-0.022***	-0.021***	-0.022***	-0.021***	-0.021***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
GDP per capita (Log)	-1.728***	-1.218***	-1.544***	-1.481***	-1.761***	-1.761***
	(0.371)	(0.347)	(0.416)	(0.415)	(0.369)	(0.369)
Observations	52,312	52,312	51,629	51,629	52,693	52,693
R-squared	0.498	0.498	0.502	0.502	0.499	0.499
Birth cohort FE	✓	✓	✓	✓	✓	✓
Country FE	✓	✓	✓	✓	✓	✓

Note: The table is from EHIS Wave 1. We selected people 20 to 54 years (height stability) old, and for heights greater than cm 130. All regressions contain 5- and 3-years average and national fixed effects. Robust standard errors are in parenthesis (*** p<0.01, ** p<0.05, * p<0.1). Country-controls are: Infant mortality, GDP per capita (log), Healthcare access, Conflict intensity. Definitions and sources provided in Table 1.

Table A7 - Looking at the Stock of Democratic Capital at Birth

Demo indexes	*V-Dem Additive*		*V-dem Multiplicative*		*Polity Score*		*Cont. ML Index*		*Average*
Baseline	*2.261*	*% increase*	*1.739*	*% increase*	*0.066*	*% increase*	*1.313*	*% increase*	
MA: 5-1-0	3.158	39.67%	2.401	38.07%	0.100	51.52%	2.119	61.39%	43.09%
MA: 10-1-0	3.670	62.32%	2.790	60.44%	0.134	103.03%	2.748	109.29%	75.26%
MA: 15-1-0	4.251	88.01%	3.097	78.09%	0.158	139.39%	3.404	159.25%	101.83%
MA: 20-1-0	4.461	97.30%	3.085	77.40%	0.160	142.42%	3.699	181.72%	105.71%
Demo dummies	*Polity Dummy*		*BMR*		*BMR (Female Franchise)*		*Dichot. ML Index*		*Average*
Baseline	*1.295*	*% increase*	*1.240*	*% increase*	*1.465*	*% increase*	*1.213*	*% increase*	
MA: 5-1-0	1.879	45.10%	2.043	64.76%	2.139	46.01%	1.971	62.49%	51.95%
MA: 10-1-0	2.523	94.83%	2.595	109.27%	2.403	64.03%	2.559	110.96%	89.38%
MA: 15-1-0	3.151	143.32%	2.914	135.00%	2.369	61.71%	3.120	157.21%	113.34%
MA: 20-1-0	2.800	116.22%	2.677	115.89%	2.014	37.47%	3.289	171.15%	89.86%

Notes: Results from cohort dataset; the sample contains adult population from 20 to 55 years old taller than 130cm and whose country of response coincides with country of birth. In all regressions we use Country & Year double clustered SEs; *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Country controls are: Infant mortality, GDP per capita (log), Healthcare access, Conflict intensity. Definitions and sources provided in Table 1. For more information about the Continuous and Dichotomic Democracy ML Indexes, please see Gründler and Krieger (2021b). All results report only the coefficients of interest, obtained including the country controls.

Table A8 – Results from Quantile Regression

Variable	Quantile	Coefficient	St. Err.	P>z	CI (95%)		Variable	Quantile	Coefficient	St. Err.	P>z	CI (95%)	
Polity Score (normalized 0 to 1)	10%	0.151	0.047	0.001	0.060	0.243	BMR Dummy	10%	2.253	0.759	0.003	0.766	3.740
	30%	0.106	0.030	0.000	0.048	0.165		30%	1.739	0.489	0.000	0.781	2.697
	50%	0.075	0.025	0.003	0.025	0.124		50%	1.369	0.411	0.001	0.564	2.174
	70%	0.042	0.030	0.166	-0.017	0.102		70%	0.991	0.495	0.045	0.021	1.962
	90%	-0.004	0.048	0.933	-0.098	0.090		90%	0.459	0.779	0.555	-1.068	1.987
Variable	Quantile	Coefficient	St. Err.	P>z	CI (95%)		Variable	Quantile	Coefficient	St. Err.	P>z	CI (95%)	
V-Dem Additive Index	10%	4.047	1.242	0.001	1.613	6.481	BMR Dummy Female Voting	10%	2.359	0.708	0.001	0.970	3.747
	30%	3.094	0.797	0.000	1.531	4.657		30%	1.893	0.456	0.000	1.000	2.787
	50%	2.419	0.670	0.000	1.104	3.733		50%	1.562	0.384	0.000	0.810	2.313
	70%	1.723	0.808	0.033	0.139	3.307		70%	1.218	0.463	0.009	0.310	2.126
	90%	0.742	1.274	0.560	-1.755	3.239		90%	0.737	0.730	0.312	-0.693	2.167
Variable	Quantile	Coefficient	St. Err.	P>z	CI (95%)		Variable	Quantile	Coefficient	St. Err.	P>z	CI (95%)	
V-Dem Multiplicative Index	10%	3.180	0.987	0.001	1.245	5.115	Polity Dummy (0-threshold)	10%	2.478	0.759	0.001	0.990	3.967
	30%	2.412	0.634	0.000	1.170	3.655		30%	1.855	0.489	0.000	0.897	2.812
	50%	1.869	0.534	0.000	0.823	2.915		50%	1.408	0.411	0.001	0.603	2.213
	70%	1.307	0.644	0.042	0.044	2.569		70%	0.952	0.495	0.054	-0.018	1.922
	90%	0.519	1.013	0.609	-1.468	2.505		90%	0.307	0.780	0.694	-1.222	1.835
Variable	Quantile	Coefficient	St. Err.	P>z	CI (95%)		Variable	Quantile	Coefficient	St. Err.	P>z	CI (95%)	
Continuous Machine Learning Index	10%	2.459	0.819	0.003	0.853	4.064	Dichotomous Machine Learning Index	10%	2.288	0.763	0.003	0.793	3.783
	30%	1.887	0.527	0.000	0.855	2.920		30%	1.735	0.491	0.000	0.772	2.697
	50%	1.479	0.443	0.001	0.611	2.347		50%	1.338	0.413	0.001	0.529	2.146
	70%	1.062	0.534	0.047	0.015	2.108		70%	0.932	0.497	0.061	-0.043	1.907
	90%	0.471	0.842	0.576	-1.179	2.120		90%	0.360	0.783	0.646	-1.176	1.895

Notes: Results from cohort dataset; the sample contains adult population from 20 to 55 years old taller than 130cm and whose country of response coincides with country of birth. In all regressions we use Country & Year double clustered SEs; *** p<0.01, ** p<0.05, * p<0.1. All plotted regression coefficients are obtained by including regional and age-cohort fixed effects, country controls are included as well. Country controls are: Infant mortality, GDP per capita (log), Healthcare access, Conflict intensity. Definitions and sources provided in Table 1. Figure shows the results from quantile regressions following Machado, J. A., & Silva, J. S. (2019). Quantiles via moments. Journal of Econometrics, 213(1), 145-173. See also Figure 4 for the plotted estimates, and Gründler and Krieger (2021b) for the definitions of the Machine Learning indexes.

Appendix Section Figures

Figures A1 – A4 – Democracy Scores from 1959 to 1995

Fig. A1. Austria

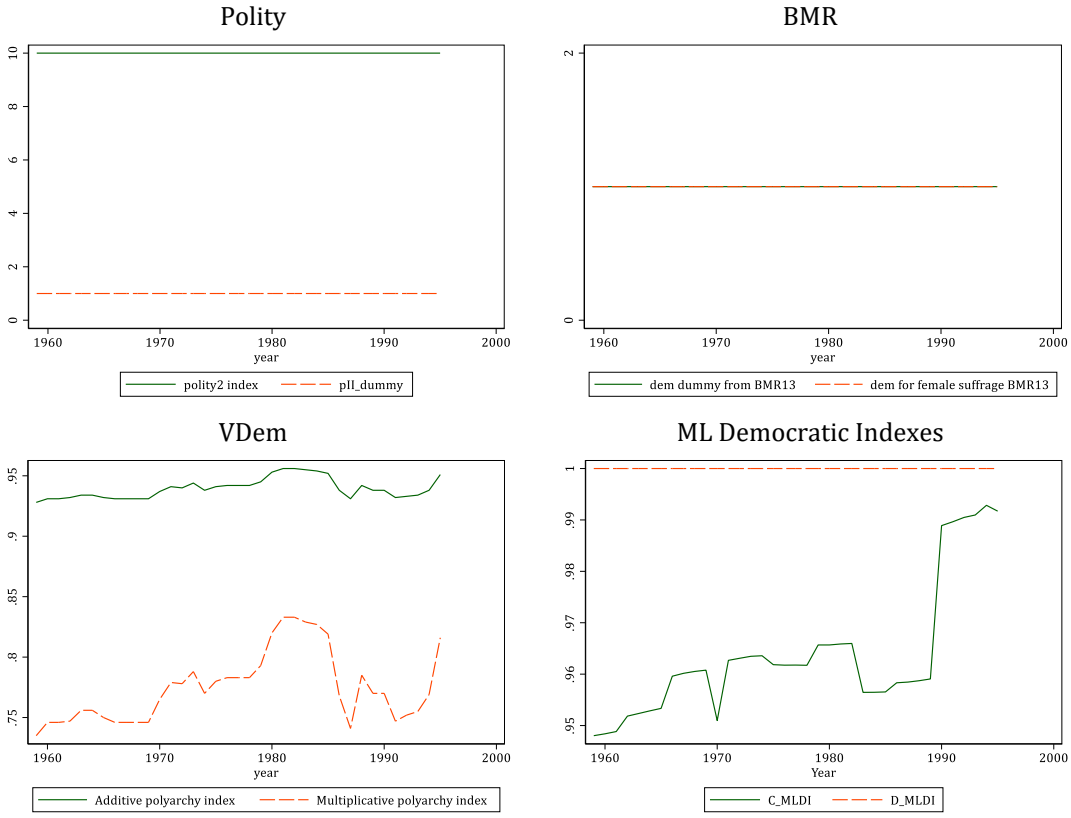


Fig. A2: Czech Republic

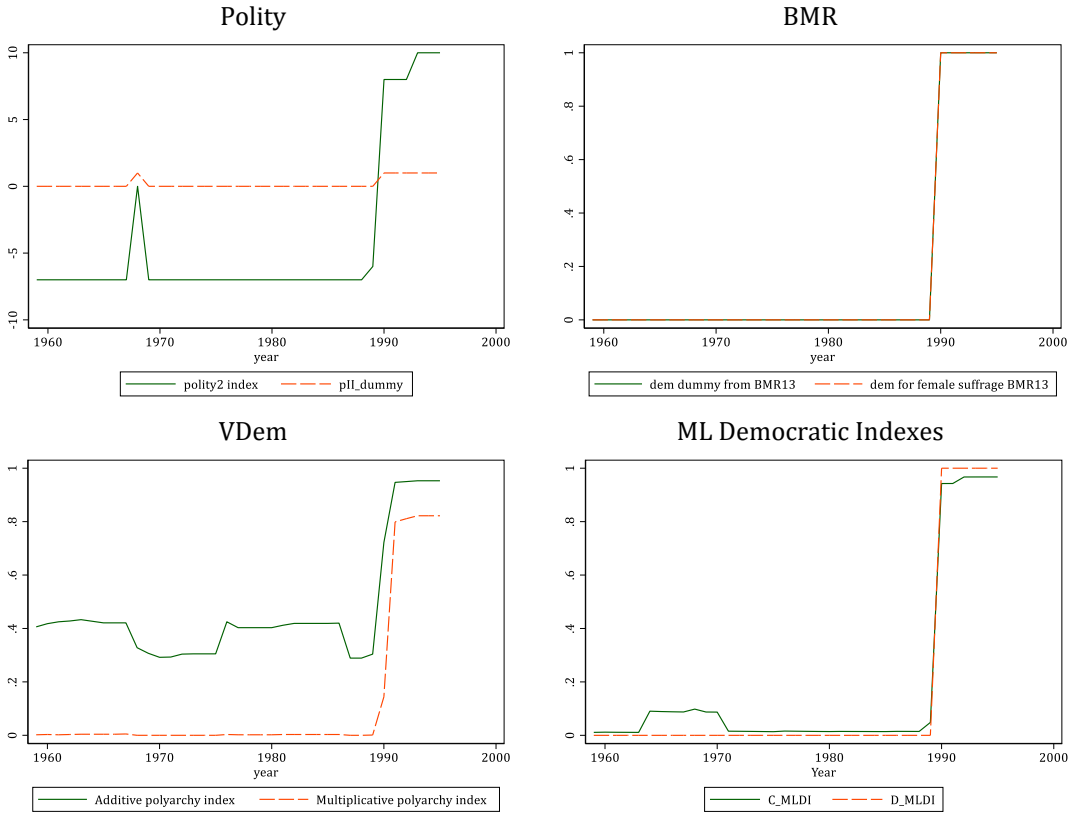


Fig. A3: Spain

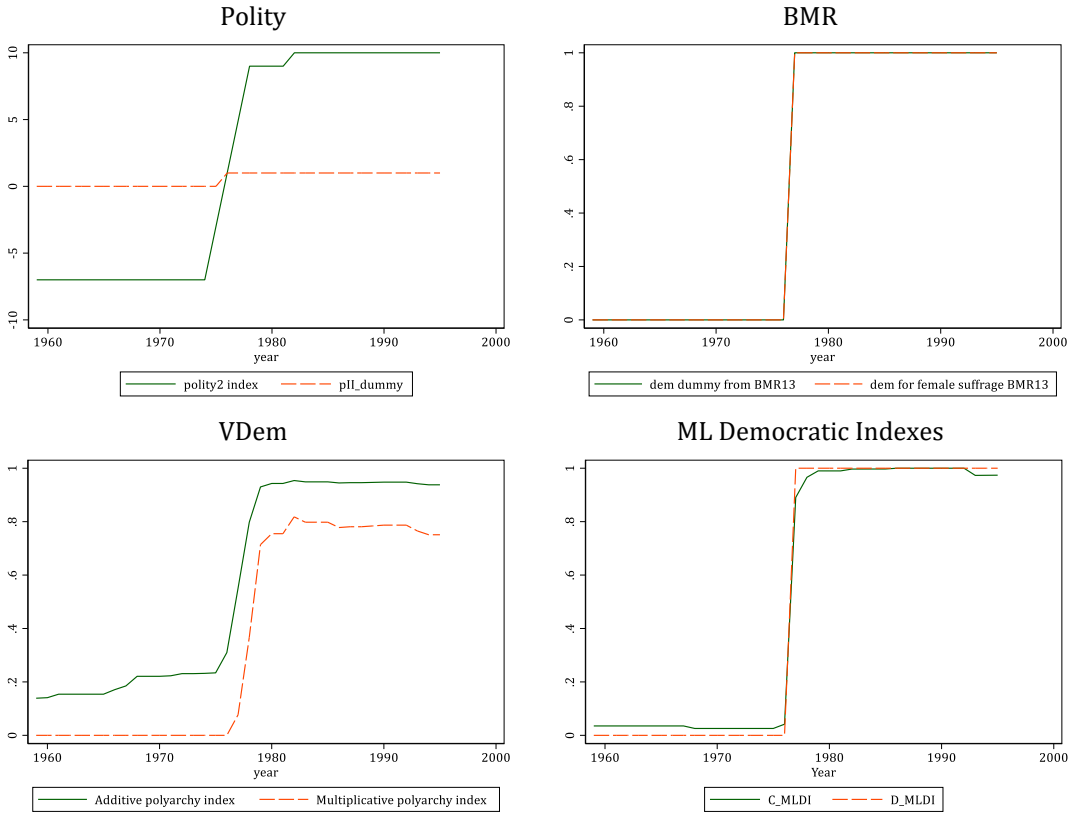


Fig. A4: Turkey

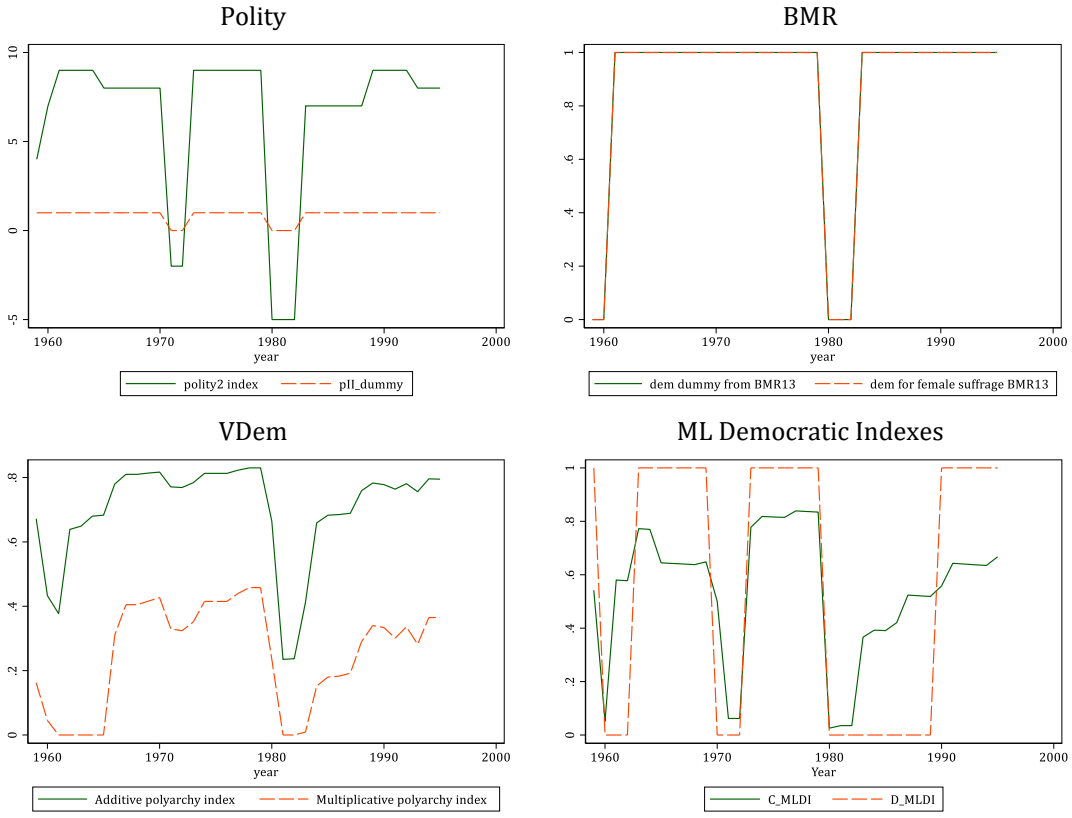
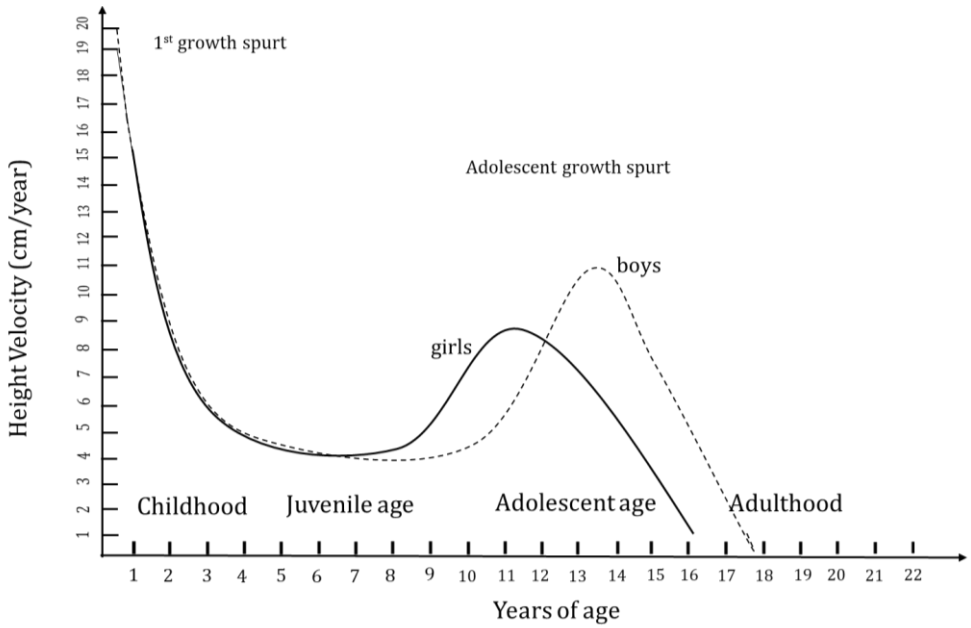
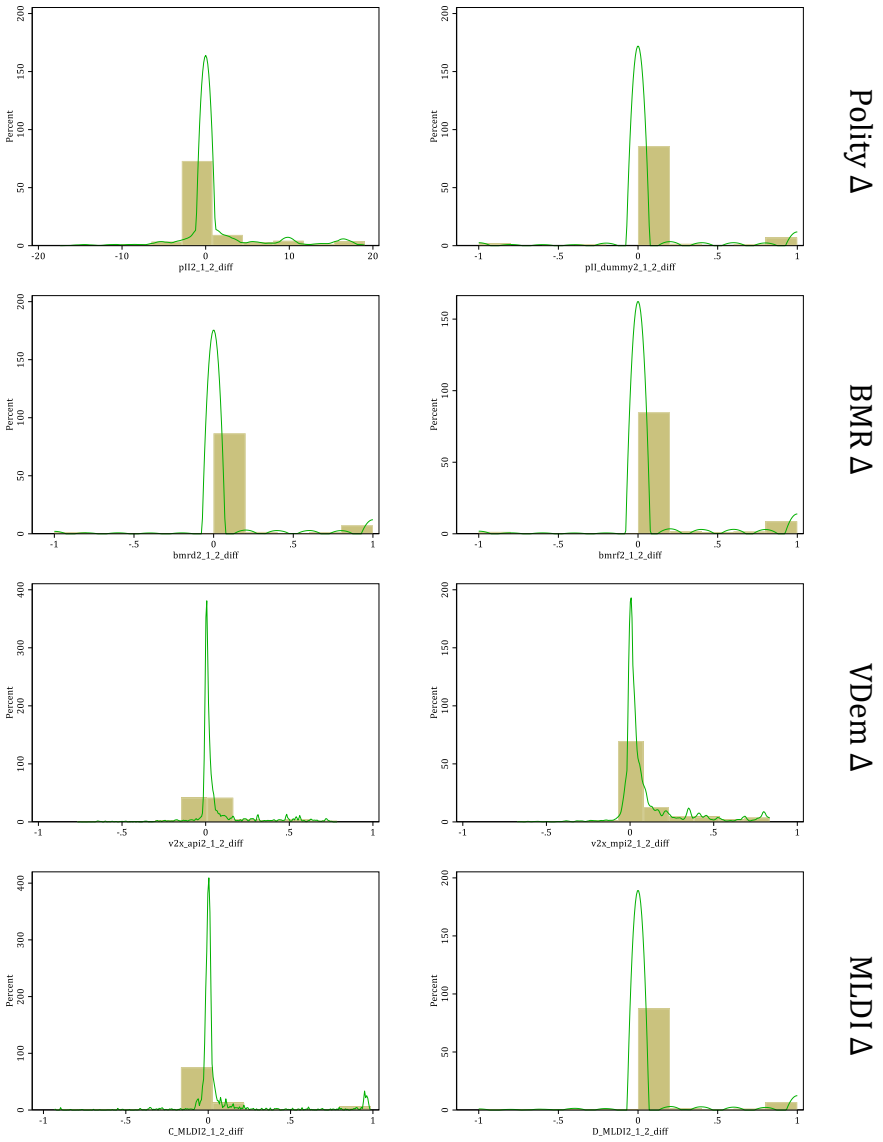


Figure A5 – Dynamics of Height Plasticity Before Adulthood



Notes: Typical qualitative representation of the dynamics of Height Plasticity before adulthood by gender. See, for example, Beard and Blaser (2002), p. 481.

Figure A6 – Distribution of Differences Between Childhood and Adolescence Democracy Scores



Notes: Distributions of the differences between choldhood and adolescent years. For male population we calculated the difference between the democracy score at birth and an average of the democratic score between 12 and 16 years old. For female the same difference, but between 10 and 14 years old. See Table 9 in main text for full results. Figue A5 provides a rationale for the differences in ages chosen for male and female population.