Democracy, Trust, and Political Orientation: Disentangling Mechanisms Shaping Individuals' Vaccine Attitudes

Authors

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Abstract

Context: In recent decades, many countries experienced a reduction in the quality and functioning of democratic institutions and norms, accompanied by rising social distrust and opposing political views. The decline in vaccine confidence might be linked to these trends. This study explores the political factors influencing individual attitudes towards vaccination across 22 upper-middle-income and high-income countries, examining the interaction between political orientation, trust in public health authorities, and levels of democracy.

Methods: Using the VaxPref database, encompassing demographically representative data from 50,242 respondents collected between July 2022 and June 2023, our analysis operates on three levels: pooled sample, democracy groups, and country-specific analyses.

Results: We found that higher democracy scores generally correlated with lower levels of vaccine scepticism. People at the centre and on the right of the political spectrum expressed more scepticism towards vaccines overall. However, trust in public health authorities emerged as the determinant which explains the largest variation in vaccine attitudes.

Conclusions: Our findings suggest a greater effectiveness of democratic systems in fostering vaccine confidence, and the need to depoliticise vaccination efforts. Building and maintaining trust in scientific information and technical expertise is critical. Blunt measures like vaccination mandates may not sustain long-term confidence, particularly in democratic contexts. Effective interventions should prioritise comprehensive school-based education to promote preventive health behaviours, coupled with trust-enhancing targeted communication strategies

Keywords: Vaccine hesitancy, Democracy, Political orientation, Trust, Vaccine

1. Introduction

In recent decades, many countries experienced a reduction in the quality and functioning of democratic institutions and norms, a process defined as democratic backsliding (Norris 2022; Gora and de Wilde 2022). This reduction has been accompanied by a concurrent growth in social distrust, defined here as the erosion of citizens' confidence in political leaders and institutions (Hosking 2019; Rosanvallon and Goldhammer 2008), and the spread of extreme political views (Boese et al. 2022; Roberts 2022).

The decline in trust has affected institutions across different sectors, with healthcare institutions being particularly impacted (Cummings 2014). A clear example of the trust erosion in public health is the decline in vaccine confidence (Eagan, Larson, and de Figueiredo 2023; Lane et al. 2018), highlighted by the WHO's declaration of vaccine hesitancy as one of the top ten global health threats in 2019 (World Health Organization 2019).

The COVID-19 pandemic both illuminated and exacerbated these trends. The rapid development of COVID-19 vaccines, accompanied by a lack of trust in public institutions and significant misinformation diffusion regarding vaccines' safety and efficacy, fuelled vaccine reluctance among segments of the population (Lazarus et al. 2021). Meanwhile, government efforts to achieve vaccination targets by climbing the "ladder of intrusiveness" in public policy (Profeti and Toth 2023; Cacace, Castelli, and Toth 2024) further heightened distrust in some countries, especially through the use of vaccine mandates or health passes (Bardosh et al. 2022; Soveri et al. 2024; Schmid et al. 2024).

A vast literature is available on the different drivers of individual attitudes towards vaccines and vaccination, including political, socioeconomic, and psychological factors.

However, the relationship between general vaccine confidence, individual political factors, and democratic backsliding has not yet been investigated simultaneously and in a multi-country setting.

Political systems and institutions are crucial in shaping the conditions for the adoption of public health policies and determining their success or failure (Greer et al. 2017; Ruger 2020). Strong democracies are often associated with better health outcomes, and efficient healthcare systems (Wigley et al. 2020; Bollyky et al. 2019; Fujiwara 2015; Kavanagh and Singh 2020). This positive association has also been confirmed for COVID-19 vaccination outcomes (Trent et al. 2022; Kyprianidou et al. 2023). The decline in democracy observed in recent decades could potentially be a driver of the reduced vaccine confidence and population coverage observed in some countries.

By design, democratic systems and their elected politicians are presumed to be responsive to the needs of the population, providing benefits and protections for all (Abbasi et al. 2018). This political mechanism, shaped by electoral incentives, is expected to drive the promotion of public health policies that benefit the broader population, with vaccination coverage being a prime example. In contrast, autocratic regimes often prioritize narrower, specific interests (Willison et al. 2023). Furthermore, democracies tend to provide more education to their citizens compared to autocracies (Acemoglu et al. 2018), a factor generally associated with higher vaccine acceptance (Antonini et al. 2024; Antonini et al. 2025; Lazarus et al. 2021). However, Larson et al.'s (2016) global confidence survey revealed an opposite association: countries with higher levels of education and good access to health services exhibit higher levels of negative sentiment toward vaccines. The authors associated these findings with the considerable variability in the correlations between education and vaccine confidence observed in previous literature, emphasising that no clear pattern

emerges, except that higher education does not necessarily imply greater confidence in vaccines.

Democracies are also often associated with higher levels of institutional trust due to transparency, accountability, and public deliberation. These factors foster an environment where citizens feel empowered through access to information, active participation in democratic processes, and robust civil institutions, enabling them to effectively scrutinise policies and hold leaders accountable for their actions (Andrain and Smith 2006; Greer et al. 2017). Democratic backsliding, weakening checks and balances, erosion of rights, and increased inequality, can severely undermine these dynamics, leading to a deterioration in trust (Norris 2022; Falkenbach and Willison 2022). In addition, effective democracies foster and protect "engaged distrust" by directing scepticism towards political institutions, such as legislatures and elected executives, rather than public agencies or ministries responsible for providing broadly agreed public goods like vaccines and other public health provisions.

Trust may operate as a mediator between democracy and vaccine behaviours, shaped not only by the political system but also by governance quality, responsiveness, and the perceived legitimacy of policies (Uslaner 2002). For example, Falkenbach et al. (2022) highlighted the significant role of trust in government, defined as the confidence citizens have that governmental actions will do what is right and perceived as fair, as a key driver for COVID-19 vaccination uptake in Canada, Denmark, and the US. More generally, trust in governments and public authorities has been found to play a crucial role in the acceptance and compliance to non-pharmaceutical policies against COVID-19 in various studies (Bargain and Aminjonov 2020; Brodeur et al. 2021; Jäckle et al. 2023). Denemark et al.(2022) found similar results in a non-COVID-19 setting.

At the same time, the relationship between democracy and trust in public health authorities is not unidirectional, especially in health and public health. Commonly defined authoritarian regimes, such as Singapore or China, often enjoy high trust in their public health systems due to performance legitimacy rather than democratic accountability (He and Warren 2011). In contrast, established democracies facing governance challenges or perceived inefficiencies can experience distrust, even in the presence of robust democratic institutions. This dynamic suggests that democracy and trust are related but not synonymous; democratic systems alone do not automatically produce trust (Inglehart 1999).

An additional dimension that may drive vaccine attitudes is an individual's political orientation, a driver linked to the increased politicization of public health issues observed worldwide (Gauchat 2012; Ward et al. 2020). For example, Motta (2021) found that political partisanship in the US influence perceptions toward scientific authorities, which in turn mediate the effects of political ideology on vaccine attitudes. This partisan polarisation, rooted in how certain political groups navigate the intersection of science, politics, and economics (Peretti-Watel, Verger, and Ward 2024), undermines the perceived neutrality of scientific institutions (Gauchat 2012; Motta 2021). This erosion of neutrality reflects, and reinforces, the failure of democratic systems to effectively channel "engaged distrust" into political institutions, instead allowing it to spill over into public bodies (Warren, 2017).

Given the complex relationships between democracy, public health, and trust, a critical question arises: are democratic institutions a necessary precondition for widespread vaccine acceptance, or does trust in governance matter more regardless of the political system? A clear understanding of the interplay between these different factors may help policymakers identify political challenges to encourage future universal vaccination and reinforce the relevance of well-functioning democratic institutions for achieving global health needs.

Previous literature investigating the drivers of vaccination attitudes highlighted trust towards health authorities as a key predictor for vaccine acceptance (Choi and Fox 2022; Wollebæk et al. 2022; Stoeckel et al. 2022; Mesch and Schwirian 2015). Others have focused on political orientation and disenfranchisement (Kennedy 2019; de Figueiredo et al. 2020). Some studies have identified a positive correlation between vaccine hesitancy or refusal and support for far-right parties (Serrano-Alarcón et al. 2023; Wollebæk et al. 2022), conservative parties (Choi and Fox 2022; Motta 2021), and voting for populist parties (Kennedy 2019). However, others have found that extreme views, irrespective of someone's political orientation or disenfranchisement, play a role in vaccination attitudes. For instance, analysing data from France, Ward et al. (2020; 2024) reported that individuals associated with both far-left and far-right parties, as well as those unaligned with any party, were more likely to resist vaccination. Similarly, Hornsey et al. (2021), among Spanish residents, found that the most vaccine-hesitant group comprised highly educated respondents expressing strong liberal tendencies, while the second most hesitant group comprised less educated individuals with politically extreme views (both left and right).

Such heterogeneity of findings across countries could suggest that the relationship between political and vaccine attitudes might be highly context-dependent (Debus and Tosun 2021; Czarnek, Kossowska, and Szwed 2020). However, most individual-level analyses have focused on single-country data (mostly in the US, and to some extent in Europe), with some exceptions (Stoeckel et al. 2022; Kennedy 2019). Whilst single-country data are crucial to provide detailed and specific indication to national policymakers, they fall short in providing a general picture of the global trends reflecting the association between political orientation and vaccination attitudes. As epidemics and vaccination campaigns display their effects beyond one country’s border, monitoring the global sentiment is crucial to inform global policymaking. Moreover, the different political factors that might affect vaccine attitudes are

often studied in isolation. Considering them simultaneously allow researchers and policymakers to investigate which political component is relatively more relevant in explaining vaccine attitudes. Furthermore, running a multi-country analysis allows us to compare how different levels of democratic backsliding are associated with vaccination attitudes.

We contribute to the existing literature by providing a structured and systematic analysis of the individual political determinants affecting general vaccination attitudes, simultaneously, adopting a multi-country perspective and controlling for countries' democratic levels. Specifically, this paper investigates the relationship between individuals' political orientation, trust in public health authorities (PHA), and their vaccination attitudes, testing which political dimension is more explanatory of their positive (or negative) attitudes. To do so, we conducted three levels of analysis based on different aggregation of the countries (i.e., pooled sample, by democratic levels, and by country-level). We leveraged the VaxPref database (Antonini et al. 2024), analysing data from 50,242 respondents across 22 upper-middle and high income countries covering six continents between July 2022 and June 2023. This dataset offers information on respondents' attitudes towards vaccines in general using the VAX scale (Martin and Petrie 2017), socioeconomic characteristics, political views, and political orientation on the left-right scale.

Our findings shed light on the complex interplay between political factors (both individual and institutional) and general vaccine attitudes, offering insights into potential drivers of vaccine hesitancy and refusal across diverse socio-political contexts and democratic levels in high and upper-middle income countries. Moreover, exploiting the data collection period, this paper sheds light on attitudes towards vaccination in general (i.e., not only COVID-19 vaccines) after the peak of the pandemic

2. Methods

2.1 Study Design and Data Collection

To investigate the association and the relative role of political determinants in individuals' vaccination attitudes, we utilized data from the VaxPref database (Antonini et al. 2024). This dataset employed a cross-sectional design based on a large global survey spanning 22 countries (n=50,242) between July 2022 and July 2023. Australia, Brazil, Chile, Croatia, France, India, Israel, Italy, Latvia, Lithuania, Norway, Russia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Turkey, the United Kingdom, and the United States were included. Countries were chosen to provide variation on the epidemiological impact of COVID-19, the government policy responses to the pandemic generally, and measures adopted to increase vaccine uptake (i.e., vaccine mandates).

Respondents comprised individuals aged >18 years from the general population. The sample size in each country was based on the country's population. Countries with a population of more than 15 million people had a sample size of 3,000 respondents; those with a population of between 5.6 million and 15 million had 1,500 respondents; and those with a population of less than 5.6 million had 1,000 respondents. Table A1 reports the total number of respondents in each country and the underlying population. To ensure demographic representativeness, a specialized market research company (Demetra Opinioni.net) conducted the online survey using Computer Assisted Web Interviewing (CAWI) methodology and implemented quota sampling based on age, gender, and location as reported by the official statistics in each country. Speeders were removed to avoid low quality responses. For a full overview of the survey and its components see Antonini et al. (2024).

The initial questionnaire was developed for English-speaking countries and for Italy. The English and Italian language questionnaires were tested using think-aloud interviews with 13 experts from government bodies and academia and further refined with 20 members of the general public. Once this process was finalised, the survey was translated into other languages by professional translators, and these versions were checked by researchers who were bilingual in the local language and English.

Ethics approval was provided by the Human Care and Ethics Committee of the University of Newcastle, Australia (n. H-2021-0363).

2.2 Definitions and Operationalization of the Variables

Vaccination Attitudes

The key dependent variable of interest in this study is vaccine attitudes derived from the VAX scale (Martin and Petrie 2017). Attitudes refer to individuals' beliefs, opinions, and feelings toward vaccination (Yaqub et al. 2014; Dubé et al. 2013). These can include perceptions of vaccine safety, efficacy, necessity, and potential risks. Attitudes can be shaped by cultural and political influences, personal experiences, media coverage, and information sources (Dubé et al. 2013; Dubé et al. 2021)[1]. By examining general attitudes towards vaccination rather than specific vaccination behaviours, we mitigate potential biases arising from the implementation of vaccination mandates in some countries included in our sample. This is particularly relevant for our data collected at the end of the COVID-19 pandemic.

[1] Behaviours, on the other hand, represent the actions individuals take regarding vaccination. This includes whether they choose to get vaccinated, adhere to recommended vaccination schedules, or comply with public health guidelines related to vaccination. While attitudes can influence behaviours, they are not always perfectly aligned, as other factors such as access to healthcare, social norms, and practical considerations (i.e., accessibility of the vaccine) can also impact vaccination behaviour (Salmon et al. 2015; Yaqub et al. 2014).

The VAX scale collects information using twelve statements that cover four distinct dimensions: mistrust of vaccine benefits, worries over unforeseen future effects, concerns about commercial profiteering, and preference for natural immunity. Respondents were asked to express their level of agreement with each statement on a 6-point Likert scale, ranging from (1) "Strongly disagree" to (6) "Strongly agree." Higher scores on the VAX scale indicate stronger anti-vaccination sentiments. For our analysis, we computed the average VAX scale score at the individual level (Y_{VAX_i}). To ensure consistency in the calculation, three items reflecting mistrust of vaccine benefits were reverse-coded, so higher scores consistently indicate higher anti-vaccine sentiments. Our measure demonstrated strong internal consistency (Cronbach's alpha = 0.88).

Political Variables

To investigate the association and the relative role of political determinants in individuals' vaccination attitudes, we focused on two key political variables collected from the VaxPref questionnaire: i) individual political orientation and ii) trust towards public health authorities (PHA).

i) Political Orientation

Political orientation is a multifaceted concept with numerous interpretations found in academic literature. We define political orientation as a cohesive set of beliefs shared by a group of individuals. These beliefs shape their preferences on various political issues, which are typically measured along a single liberal–conservative scale (Carmines and Amico 2015). Previous literature found mixed results on the role of ideology on vaccine attitudes (Czarnek, Kossowska, and Szwed 2020; Serrano-Alarcón et al. 2023; Debus and Tosun 2021; Wollebæk et al. 2022; Ward et al. 2020). Studies have identified a lower likelihood of vaccination in

countries with higher proportions of populist or extreme voters (Kennedy 2019; Serrano-Alarcón et al. 2023; Matthew J. Hornsey et al. 2021; Ward, Cortaredona, et al. 2024). Therefore, our primary interest is to explore differences in vaccine attitudes among voters at the extreme of the left-right spectrum compared to those in the middle ranges. We hypothesize that individuals in the middle ranges will exhibit more positive attitudes towards vaccines compared to those at the extremes.

We measured political orientation using the question '*In politics, people sometimes talk of "left" and "right". On a scale from -5 to 5 where -5 means the left and 5 means the right, where would you place yourself on this scale?*'. Respondents answered the question using an 11-point scale ranging from -5 to 5. Recognizing that respondents may identify with the centre for various reasons, such as being apolitical, rejecting the left-right dichotomy, or simply being politically moderate (Feinberg et al. 2020), we subdivided the scale into five groups. These groups are as follows: (1) "far left" for orientations below -3 on the left-right scale; (2) "centre-left/left" for orientations between -3 and -1; (3) "centre" (baseline) for respondents placing themselves at the centre of the spectrum; (4) "centre-right/right" for orientations between 1 and 3; and (5) "far right" for orientations above 3. This granularity allowed us to investigate the correlation between orientation and vaccination, adopting the centrifugal competition framework proposed by Sartori (2005), with a particular focus on the extreme ends of the spectrum to capture those with strong ideological affiliations. In line with our hypothesis, we used the centre dummy as the baseline in the model, ensuring that all coefficients are interpreted relative to the centre.

ii) Trust Towards Public Health Authorities

Trust is a key dimension in explaining adherence to public policies (OECD 2017). Following Hardin's definition (2002), trust involves the belief in the trustworthiness of someone (or

something) within a specific context. This definition aligns with Falkenbach et al. (2022), who describe trust as the confidence citizens have that governmental actions will be right and perceived as fair. Individuals' trust in public authorities, especially public health authorities (here defined as the government or quasi-governmental agencies and organizations responsible for the protection and promotion of public health), has been shown to be a key predictor of individuals' decisions to get vaccinated (Choi and Fox 2022; Wollebæk et al. 2022; Stoeckel et al. 2022; Krupenkin 2021; Ward, Cortaredona, et al. 2024; Denemark, Harper, and Attwell 2022). These studies suggest that trust in PHA has a greater impact in vaccination decisions than political affiliation (Choi and Fox 2022). This is largely because most people receive information and develop positive beliefs about vaccination from healthcare institutions (Dubé et al. 2021). Additionally, whilst mistrust may drive political orientation or partisanship, mistrust of institutions is not limited to one political group (Choi and Fox 2022). Conversely, lower trust in health authorities correlates with reduced support for vaccinations (Salmon et al. 2015; Dubé et al. 2013; Yaqub et al. 2014; Falkenbach and Willison 2022). Therefore, we hypothesize that lower levels of trust will be associated with higher vaccine scepticism.

The questionnaire collected this information using the following statement: '*I trust the public health authorities for the management of the pandemic'.* Respondents indicated their level of agreement with this statement on a 6-point Likert scale, ranging from (1) 'Strongly disagree' to (6) 'Strongly agree'. Given that trust is not strictly political in nature, we used this variable as an additional control to better isolate the effect of the political orientation on vaccine scepticism

Democracy and Backsliding

In the last decade, democracy regressed worldwide (Wiebrecht et al. 2023). Countries experienced democratic backsliding, defined as the state-led debilitation or elimination of the political institutions sustaining an existing democracy (Bermeo 2016). Democracies tend to correlate with better health outcomes, including higher vaccination outcomes (Trent et al. 2022; Kyprianidou et al. 2023).

Democratic systems are designed to be responsive to population needs, driving public health policies like vaccination that benefit diverse groups, unlike autocracies that typically serve narrower interests (Abbasi et al., 2018; Willison et al., 2023). Democracies also tend to provide more education, a factor linked to higher vaccine acceptance (Acemoglu et al., 2018; Antonini et al., 2024). Yet, Larson et al.'s (2016) survey found that higher education and better health access can correlate with greater negative sentiment toward vaccines.

Strong democratic institutions foster positive vaccine attitudes through their core features of transparency, accountability, and public deliberation. They equip citizens with mechanisms of vigilance (Andrain and Smith 2006), enabling oversight of vaccine development, approval, and safety processes. Transparency in the decision-making process further allows the public to engage with or understand the workings of the scientific and regulatory authorities responsible for vaccine approval and dissemination. In line with the Executive Constraint Hypothesis, democratic governance subjects executive decisions, such as vaccine mandates, to legislative scrutiny, ensuring fairness across diverse societal groups (Patterson and Veenstra 2016).

These democratic mechanisms are also expected to enhance citizens' trust towards the scientific bodies, and, consequently, foster positive attitudes towards vaccination compared to more authoritarian countries (Andrain and Smith 2006). Similarly, they are expected to limit the politicization of public health issues, reducing the impact of partisanship on vaccine

attitudes and behaviours, an issue that has been exacerbated by the emergence of populist leaders and ideology in many advanced democracies (Norris 2020).

Nevertheless, we cannot ignore the fact that some commonly defined authoritarian regimes, such as Singapore or China, often enjoy high trust in their public health systems due to performance legitimacy rather than democratic accountability (He and Warren 2011). These two countries also report very high vaccination rates, especially during the COVID-19 pandemic. This highlights an alternative pathway where trust in governance stems from perceived efficiency rather than participatory or transparent processes. Therefore, it is relevant to investigate whether democratic institutions are a necessary condition to improve vaccine uptake and promote universal vaccination policies. Our hypothesis posits that individuals in countries experiencing lower democracy may exhibit relatively higher levels of vaccine hesitancy or refusal compared to less democratic countries.

Given the cross-sectional nature of our data, we cannot directly investigate the causal effect of democracy into general vaccination attitudes. However, we can investigate its association with the VAX scale. Furthermore, we aimed to explore whether similarities in vaccination attitudes exist among respondents from countries with similar democratic levels. Accordingly, we grouped countries in high, medium, and low democracies based on the V-Dem electoral democracy index (EDI) (Coppedge and Altman 2024). The EDI measures the extent to which the ideal of electoral democracy is realised. It is constructed by combining five core components, adopting Dahl's (1984) concept of polyarchy: suffrage, free and fair elections, elected officials, freedom of civil and political organisation, and freedom of expression.

To group countries, we computed the average EDI scores for the period 2015-2022. Taking the average allows us to control for the starting EDI level of each country and the democratic trend over time, including potential backsliding[2].

Table 1 reports the EDI levels across the countries included in the sample. The range went from 0.26 in Russia to 0.91 in Sweden. To ensure homogeneous classifications, we classified countries with an EDI above 0.80 as *high democracies* (Australia, France, Chile, Italy, Latvia, Lithuania, Norway, Slovakia, Slovenia, South Korea, Spain, Sweden, the UK, and the US), those with scores above 0.50 and up to 0.80 as *medium democracies* (Brazil, Croatia, Israel, and South Africa), whilst those below 0.50 as *low democracies* (India, Russia, Singapore, and Turkey).

Table 1: Average EDI levels 2015-2022

Country	**Democracy scores (EDI 2015-22)**		
	Low	**Medium**	**High**
Australia	-	-	0.85
Brazil	-	0.74	-
Chile	-	-	0.86
Croatia	-	0.76	-
France	-	-	0.88
India	0.46	-	-
Israel	-	0.73	-
Italy	-	-	0.86
Latvia	-	-	0.84
Lithuania	-	-	0.81
Norway	-	-	0.89
Russia	0.25	-	-
Singapore	0.41	-	-
Slovakia	-	-	0.84
Slovenia	-	-	0.81
South Africa	-	0.73	-
South Korea	-	-	0.82
Spain	-	-	0.86

[2] Alternative ways to directly measure backsliding over time were to simply compute the difference or the ratio between the initial (2015) and final (2022) EDI levels. While these two strategies provide the advantage of directly measuring backsliding, they fail to take into account the absolute EDI levels, which classified strong democracies versus weak democracies. Therefore, we opted for the average between 2015-2022.

Sweden	-	-	0.91
Turkey	0.30	-	-
United Kingdom	-	-	0.86
United States	-	-	0.84

Notes: The variable is calculated using the VDem EDI variable retrieved from the 2024 dataset (Coppedge and Altman 2024). Alternative classifications can be made. We distinguished three democracy groups to ensure homogeneity and comparability in democracy scores within groups and ensure more granularity across groups.

Individual Sociodemographic Information

We included age, gender, highest educational level attained, and income group as control variables for respondents' sociodemographic characteristics. Age is a continuous variable starting from 18 years old for all countries, except for Singapore, where the adult age begins at 21 years old. The variable "female" indicates the gender of the respondents, equal to 1 if the respondent identified as female and 0 otherwise. The individual's highest educational level is a categorical variable with three levels: 0 - no high-school certificate; 1 - high-school certificate; 2 - bachelor and above. We categorized income levels into three groups based on household income levels: lower-income (below 75% of the median national income), middle-income (75%-200% of the median national income), upper-income (above 200% of the median national income) (OECD 2019).

2.3 Statistical Analysis

To investigate attitudes towards vaccination, we reported descriptive statistics for the variables included and ran pairwise correlation analyses between them. For our empirical analysis, we estimated a linear regression model of the form:

$$Y_{VAX_i} = \beta_0 + \beta_1 FL_i + \beta_2 CL\&L_i + \beta_3 CR\&R_i + \beta_4 FR_i + \beta_5 trust_i + \vartheta X_i + H_c + \varepsilon_i$$

Where, Y_{VAXi} is the average VAX scale score for individual i, β_1 to β_4 reports the self-reported political orientation of individual i from "far left" (FL) to "far right" (FR), $\beta_5 trust_i$ reports the trust in PHA of individual i, ϑX_i is a vector of individual characteristics (i.e., age, female, education, income), and H_c reports country fixed effects, including for example health systems typologies, income, democratic levels and stability of the institutions. The effect of interest relies on political variables, particularly the coefficients β_{1-4} and β_5. Accordingly, we estimate three set of regressions, adding one variable at the time and then including the controls. In a fourth regression, we replaced the country fixed effects with the democracy groups categorical variable ($\beta_6 EDI_c$) to control for the association between democracy scores and individual's average VAX scale. We excluded the country fixed effects to avoid collinearity with the democracy scores.

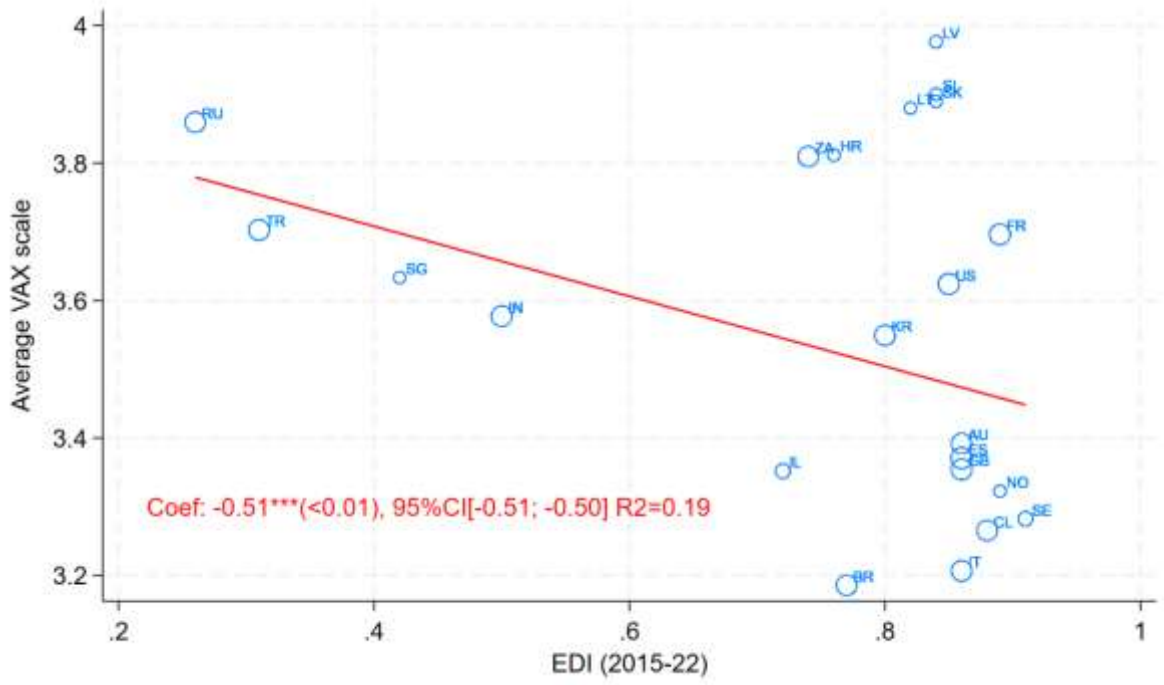
Our analysis comprises three levels. First, we pool all the observations in the dataset together. Second, we group countries based on their democracy scores, distinguishing between low, medium, and high democracies. Finally, we run the same regression at the country level to investigate the context dependency of the political variables. In the first two levels, standard errors are clustered at the country level, while robust standard errors are used for the country-level analysis.

3. Results

3.1 Descriptive Results

Figure 1 reports the relationship between democratic levels and general attitudes towards vaccines at the country level. We observed a negative relationship (-0.51, $p<0.01$), suggesting a higher average scepticism towards vaccines in relatively low democratic countries compared to relatively higher democratic countries.

Figure 1: Democracy (average EDI 2015-2022) and average VAX scale scores



*Notes: This graph is a scatterplot showing the association between the average VAX scale at the country level (y-axis) and the average EDI level between 2015-2022 (x-axis). The size of the circles reflects the sample size in each country. The solid red line represents the fitted values obtained through an OLS regression between the two variables. * p<0.10, ** p<0.05, *** p<0.01.*

Table 2 presents descriptive statistics for the variables included in our model by democracy levels and country level.

In terms of overall attitudes towards vaccines, as measured by the VAX scale, similar levels were observed between the medium (average VAX scale score = 3.51) and the high democracy groups (average VAX scale score = 3.49), whilst significantly higher scores were found in low democracies (average VAX scale score = 3.70). Significantly high levels indicative of higher hesitancy towards vaccines were observed in Eastern European countries, with the highest value recorded in the Latvian sample (4).

For the political orientation variable, all three democracy groups tended towards the right-hand side of the spectrum. Most respondents positioned themselves within the middle

ranges of the left-right scale (-3; 3). However, a notable proportion of respondents identified with the far right in several countries, including Brazil (25%), India (34%), Israel (17%), South Africa (22%), and the US (27%). Conversely, the far-left share exceeded the far-right only in Italy (9%) and Spain (11%).

Low democracies reported slightly higher values of trust towards PHA (4.5) compared to the high (4.2) and medium (4.1) democracy groups. Most samples reported average levels of trust towards PHA above the midpoint of the Likert scale (3.5), except Latvian (3.3), Croatian, and Slovakian respondents (3.5). Notably, French respondents reported relatively lower levels of trust compared to other countries (3.6). Higher levels of trust towards PHA were observed in India (5), Singapore (4.8), and Norway (4.5).

Table 2: Descriptive statistics, individual level data

Country	Age	Female	Bachelor	High income	VAX scale		Political orientation					Trust toward PHA	
	(mean)	(%)	(%)	(%)	Mean	(SD)	FL (%)	CL/L (%)	Centre (%)	CR/R (%)	FR (%)	Mean	(SD)
High Dem.	*47.2*	*51.2*	*46.2*	*19.0*	*3.5*	*(1.0)*	*5.9*	*25.0*	*22.3*	*35.2*	*11.7*	*4.2*	*(1.5)*
Australia	48.3	51.0	44.9	19.1	3.4	(1.0)	4.7	17.4	30.9	33.4	13.6	4.4	(1.5)
Chile	42.6	51.0	73.2	52.1	3.3	(0.9)	4.1	27.9	20.0	37.9	10.2	4.4	(1.5)
France	48.0	52.2	23.1	16.4	3.7	(1.0)	6.1	25.0	21.7	33.7	13.5	3.6	(1.7)
Italy	50.1	51.7	36.4	15.8	3.2	(1.0)	9.2	36.1	20.1	28.0	6.6	4.4	(1.4)
Latvia	46.1	54.4	34.5	17.3	4.0	(1.1)	3.3	18.9	22.7	45.5	9.5	3.3	(1.6)
Lithuania	48.0	54.1	67.6	7.1	3.9	(1.1)	5.5	22.3	18.0	41.6	12.7	3.8	(1.7)
Norway	47.1	49.8	51.7	5.1	3.3	(0.9)	5.0	27.9	15.8	40.5	10.8	4.5	(1.3)
Slovakia	46.3	51.1	32.3	20.2	3.9	(1.1)	6.1	26.6	21.7	39.2	6.4	3.5	(1.5)
Slovenia	47.0	50.1	45.0	24.6	3.9	(1.0)	6.7	33.5	23.7	29.4	6.8	3.9	(1.6)
Spain	47.7	50.9	43.0	6.0	3.4	(1.0)	10.6	32.9	18.0	30.3	8.2	4.2	(1.5)
South Korea	47.3	50.0	70.9	31.4	3.5	(0.7)	3.0	21.6	31.8	37.8	5.8	4.2	(1.2)
Sweden	48.2	49.9	50.5	17.2	3.3	(1.0)	5.2	28.1	14.8	42.5	9.5	4.2	(1.5)
United Kingdom	47.2	51.2	34.6	8.9	3.4	(0.9)	4.2	20.2	27.3	34.4	14.0	4.3	(1.5)
United States	46.3	51.4	47.9	11.8	3.6	(1.1)	6.1	15.7	15.9	35.7	26.7	4.2	(1.7)
Medium Dem.	*42.1*	*51.5*	*45.5*	*40.8*	*3.5*	*(1.0)*	*6.8*	*20.1*	*19.1*	*34.2*	*19.9*	*4.1*	*(1.5)*
Brazil	42.2	51.8	45.8	47.2	3.2	(0.9)	9.0	18.8	17.2	30.5	24.5	4.4	(1.4)
Croatia	47.7	51.1	45.0	17.1	3.8	(1.0)	5.6	38.2	23.5	26.8	5.9	3.5	(1.5)
Israel	42.7	50.2	52.3	11.2	3.4	(0.9)	4.2	22.6	16.7	39.7	16.8	4.1	(1.6)
South Africa	39.6	51.9	41.9	57.5	3.8	(1.0)	6.2	13.6	20.8	37.6	21.8	3.9	(1.6)
Low Dem.	*43.5*	*51.3*	*68.3*	*33.0*	*3.7*	*(0.9)*	*6.1*	*16.8*	*27.3*	*31.3*	*18.5*	*4.5*	*(1.5)*
India	39.6	49.0	81.8	36.5	3.6	(0.8)	3.2	7.2	18.6	37.4	33.6	5.0	(1.3)
Russia	47.1	54.5	63.8	21.5	3.9	(1.0)	5.5	19.2	41.2	24.4	9.7	4.0	(1.5)
Singapore	47.4	51.7	51.4	14.6	3.6	(0.7)	1.5	8.6	38.9	40.9	10.1	4.8	(1.1)
Turkey	42.6	50.4	64.4	46.8	3.7	(0.9)	11.1	26.8	18.8	28.9	14.6	4.3	(1.6)

Notes: FL= Far left; CL/L= Centre left/left; CR/R=Centre right/Right; FR=Far right. PHA= Public health authorities.

3.3 Estimation Results

A correlation analysis was conducted between variables to identify potential collinearity (see Table A2 in the Appendix).

Pooled data

Three model specifications were used to assess the determinants of vaccination attitudes (Table 3). In column (1), we included political orientation. According to this model specification, respondents in the far-left and centre-left/left groups were more likely to hold positive attitudes towards vaccines (i.e., lower average VAX scale score) (far left: b=-0.22, $p < 0.05$; centre-left: b=-0.21, $p<0.01$) compared to those in the centre, all else being equal. Conversely, individuals in the far-right group reported the opposite findings (b=0.19, $p < 0.01$).

In column (2), we included trust towards PHA. Holding all other variables constant, a 1 unit increase in the trust score was associated with a 25% reduction in the average VAX scale score ($p < 0.01$). In other words, people who trust PHA more are more likely to have positive attitudes towards vaccines, all else being equal. Upon incorporating trust into the model, the coefficients for political orientation yielded similar results to the previous regression. Notably, the significance of trust is further underscored by the improved statistical fit of the model. Transitioning from column (1) to column (2), the R-squared value increased from 8% to 23%, which indicates that trust outperforms political orientation in explaining the variation of the average VAX scale (our dependent variable) observed in the data.

In column (3), we controlled for individual characteristics. With this new specification, we found consistent results for the political variables, with only minor variations in the coefficients. Regarding the individual sociodemographic control variables, we observed that older age groups exhibited lower VAX scale scores ($p < 0.01$) compared to

the reference group (18-29 years old), while those between 30-44 were more sceptical ($p < 0.01$) on average. Similarly, identifying as female was associated with a small increase in the average VAX scale score, even if only at the 10% significance level. Interestingly, we did not find any statistically significant differences across education and income groups.

In column (4), we controlled for democracy scores. In line with our hypothesis, higher democracy scores are associated with lower vaccine scepticism ($p<0.05$). The magnitude of the coefficient is slightly larger for the medium democracy group compared to the high democracy group relative to the baseline level. All other results described in column (3) remain unchanged, with only minor variations in the coefficients.

Table 3: The effect of political attitudes and democracy on vaccination attitudes

	(1) Average VAX score	(2) Average VAX score	(3) Average VAX score	(4) Average VAX score
Far left (ref=centre)	-.218**	-.196***	-.188***	-.208***
	(.078)	(.058)	(.058)	(.057)
Centre-left/Left (ref=centre)	-.214***	-.186***	-.183***	-.196***
	(.049)	(.034)	(.033)	(.033)
Centre-right/Right (ref=centre)	-.016	-.009	-.015	-.018
	(.032)	(.027)	(.025)	(.025)
Far right (ref= centre)	.191***	.227***	.22***	.209***
	(.056)	(.061)	(.06)	(.061)
Trust in public health authorities		-.254***	-.247***	-.262***
		(.021)	(.021)	(.021)
Age 30-44 (ref=18-29)			.087***	.096***
			(.028)	(.026)
Age 45-54 (ref=18-29)			.064	.07*
			(.04)	(.039)
Age 55-64 (ref=18-29)			-.033	-.016
			(.039)	(.037)
Age >64 (ref=18-29)			-.191***	-.178***
			(.054)	(.052)
Female (ref=other)			.037*	.036*
			(.019)	(.02)
High school (ref=no high school)			.007	.001
			(.02)	(.033)
Bachelor and over (ref=no high school)			-.043	-.048
			(.034)	(.041)

Middle-income (ref=low income)			-.003	-.036
			(.021)	(.025)
High-income (ref=low income)			-.031	-.049
			(.037)	(.045)
Income not disclosed (ref=low income)			-.017	-.024
			(.021)	(.029)
Medium democracy (ref=low democracy)				-.303**
				(.126)
High Democracy (ref=low democracy)				-.273***
				(.048)
Constant	3.419***	4.536***	4.519***	4.922***
	(.017)	(.105)	(.101)	(.126)
Country fixed effects	YES	YES	YES	NO
Observations	50,242	50,242	50,242	50,242
R-squared	.074	.225	.235	.211

**** p<.01, ** p<.05, * p<.1. Standard errors clustered at the country level are in parentheses*

High versus Medium and Low Democracies

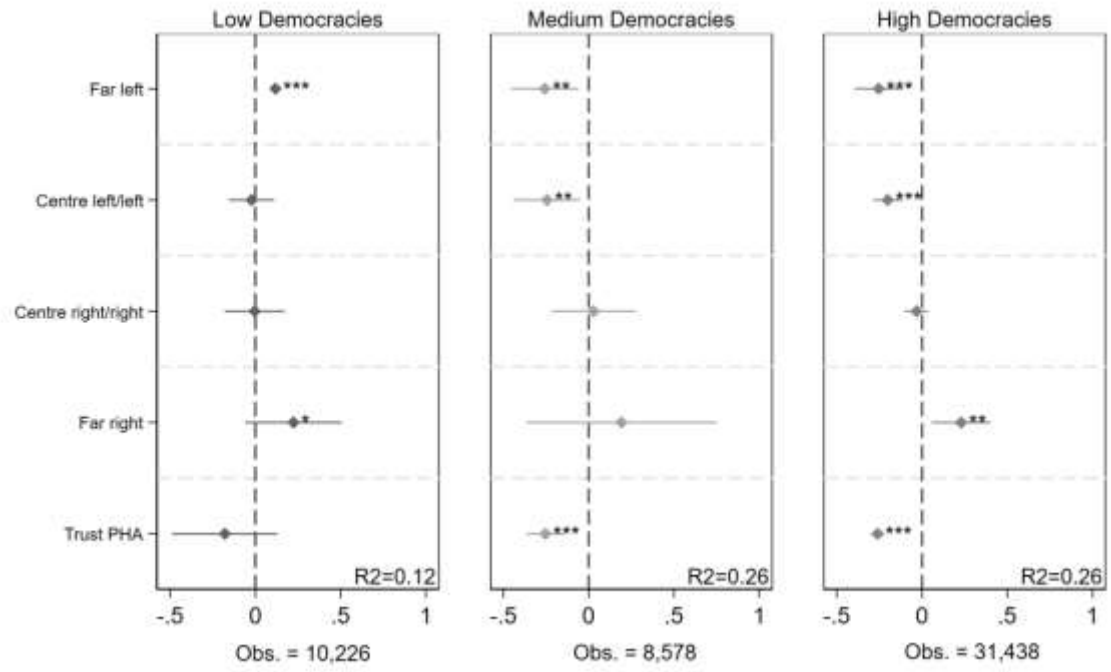
In the second level of our analysis, we grouped countries into the three democracy groups. The results of the four sets of regressions are reported in the Online Supplementary Material (OSM) 2. Here, we focus on our final specification. Figure 2 reports the coefficients of the regressions and the associated confidence intervals.

Considering political orientation, the high democracy group reported more robust differences across our categories compared to the medium and low groups. Within this group, far-left and centre-left/left individuals were less sceptical towards vaccines compared to those in the centre ($p<0.01$), while the opposite was found for the far-right group ($p<0.05$). In the medium democracies, we found a negative statistically significant difference ($p<0.05$) between the far-left and centre-left/left groups were less sceptical towards vaccines compared to those in the centre ($p<0.05$), while no statistically significant differences were found between right-leaning groups and the centre. In the low democracies group, we found that far-left group were

more sceptic towards vaccines compared to the centre ($p<0.05$), while no statistically significant differences were found across the other groups.

We confirmed the strong and negative association between trust towards PHA and vaccine scepticism for the medium and high democracy groups ($p<0.01$), but we did not find any statistically significant effect for the low democracies group. Trust also remained the most important variable in improving the goodness of fit of our models, despite it being more relevant for the high democracy group. Indeed, when including trust, the improvement in the R-squared was 8%, 15%, and 17% respectively.

Figure 2: The effect of political attitudes on vaccination attitudes in low, medium, and high democracies



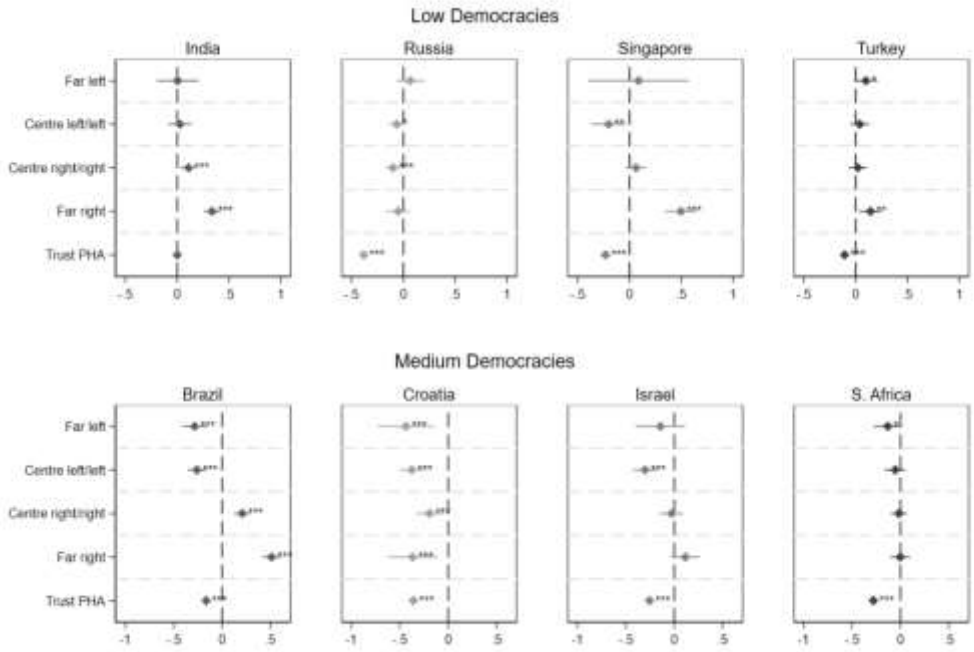
*Notes: *** p<.01, ** p<.05, * p<.1.*

Country-level Analysis

In the final level of our analysis, we focused on country-level regressions. We focus on the full model specifications, with detailed results available in the (OSM) 2.

In countries in the medium and low democracy groups (Figure 3), we confirmed that trust in PHA had a stronger explanatory power compared to the political orientation variable (e.g., the R-squared for Russia improved by 34 percentage points when including trust). The coefficient was negative and significant at the 1% level in all countries except for India, where trust seemed not to significantly influence vaccine attitudes. Instead, political orientation had significant effects in the Indian cohort, aligning with general trends (i.e., centre-right/right and far-right groups were more sceptical compared to the centre group).

Figure 3: Impact of individual political culture on the average VAX scale score across low-medium democracies (estimates are from the full specification model).

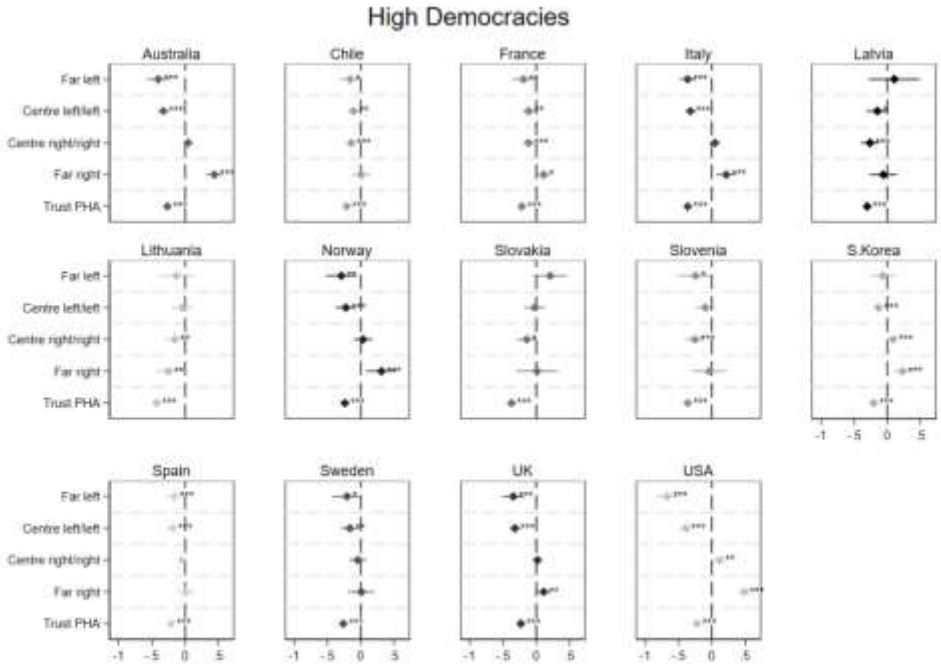


*Notes: *** p<.01, ** p<.05, * p<.1.*

Moving to the high democracies, we confirmed and reinforced our previous findings on the impact of trust (see Figure 4). Its significance was highlighted with substantial improvements in the goodness of fit of all the models, with Lithuania being the extreme case, reporting an improvement of 41 percentage points. In almost all countries, we confirmed that people on the left side of the left-right spectrum were more likely to have positive views

towards vaccines compared to those in the centre. An important highlight was observed in the US results. The US was the only country were the variation explained by political orientation in terms of the R-squared was larger than the variation explained by trust (13% versus 11% respectively).

Figure 4: Impact of individual political culture on the average VAX scale score across high democracies (estimates are from the full specification model).



Notes: *** p<.01, ** p<.05, * p<.1.

Overall, in 10 of the 22 countries included in this study, only individuals on the left of the political spectrum (either FL or CL, or both) were significantly less vaccine-sceptical than those in the centre ($p<0.05$). Conversely, only four countries (Latvia, Lithuania, Slovenia, and Russia) exhibited the opposite pattern, with individuals on the left being more vaccine-sceptical than the centre.

Instead, in nine countries, individuals on the right (either FR or CR, or both) were significantly more vaccine-sceptical than those in the centre ($p<0.05$). Importantly, there were no cases where only the FL or CL was significantly more vaccine-sceptical than the centre.

Turkey was the sole mixed case, where both the FL and FR were more vaccine-sceptical than the centre ($p<0.05$).

4. Discussion

By leveraging a large-scale dataset comprising 50,242 respondents and encompassing 22 high and upper-middle income countries, this study explored key political determinants affecting individual vaccination attitudes. Compared to previous literature, we provided a structured and systematic analysis of (some of) the individual political determinants affecting general vaccination attitudes, simultaneously, adopting a multi-country perspective and controlling for countries' democratic levels. Although a number of explanations have been advanced, few empirical studies have addressed their relative importance and the analysis of potential mediators is uncommon in this literature (Patterson and Veenstra 2016). We adopted three levels of analysis to explore general trends and identify country-specific results.

Overall, we found that, on average, respondents from countries with relatively higher levels of democracy were less likely to be sceptical about vaccines. This finding complements previous scholarship on the relevance of strong and stable democratic institutions to the adoption of effective public health measures (Greer et al. 2017; Ruger 2020; Willison et al. 2023). It is also in line with empirical evidence indicating that countries with higher levels of democracy often report better health outcomes, which are also positively correlated with vaccine support (Wigley et al. 2020; Bollyky et al. 2019; Fujiwara 2015).

However, even highly democratic countries reported high levels of vaccine scepticism, including the ex-communist countries, France, and the US. While the increased use of the internet as a source of information and the growing distrust in institutions are common causes for explaining this result, these countries have some specificities. The strong

tradition of mandatory vaccination in ex-communist countries has been found to produce backlash effects against persons' willingness to voluntarily vaccinate (Pronkina et al. 2023; Costa-Font, Garcia-Hombrados, and Nicińska 2023; Schmelz and Bowles 2021). Similarly, exposure to communism has been found to be correlated with stronger conspiratorial thinking (Matthew J Hornsey, Harris, and Fielding 2018). In France, the rise of vaccine scepticism is the results of a mix of causes, including, the multiplication of debates about vaccine safety in the traditional media since the pandemic flu of 2009, and the significant proportion of general practitioners and health workforce that have doubts about the efficacy and/or safety of vaccines (Ward et al. 2019). In the US, strong political polarization seems to play the larger role, with Republicans or those defining themselves as conservatives increasingly likely to hold positions against the scientific community (Gauchat 2012; Hegland et al. 2022) and therefore harbour doubts about vaccine safety (Motta 2021; Hegland et al. 2022).

An additional consideration which may magnify the effect of democracy is the "home country bias", the tendency for individuals to exhibit greater acceptance of domestically-produced vaccines over those sourced from abroad (Heinrich, Kobayashi, and Motta 2024). If more-democratic countries are also more likely to produce vaccines, potentially due to higher levels of economic development, this bias could explain the positive relationship between democracy ratings and vaccine attitudes. If the "home country bias" hypothesis holds, efforts to strengthen global vaccine acceptance should not only focus on improving democratic governance and institutional trust but also on promoting technology transfers and capacity-building initiatives to enable local vaccine production in low- and middle-income countries (Peter J. Hotez 2023b).

Overall, this evidence reveals that democracy can create a positive setting to build vaccine acceptance, but the presence of democratic institutions is not sufficient to boost

uptake. Other determinants, including individual political orientation and trust towards PHA, are at play.

Looking at the individual political determinants of vaccine attitudes, we reinforced previous literature in highlighting the context-specificity of the findings (Czarnek, Kossowska, and Szwed 2020; Debus and Tosun 2021; Stoeckel et al. 2022; Choi and Fox 2022; Ward, Peretti-Watel, et al. 2024). Nevertheless, we also observed common trends across countries and democratic levels. Contrary to previous literature (Serrano-Alarcón et al. 2023; Wollebæk et al. 2022; Spälti et al. 2023), we found a significant effect of political orientation even after controlling for institutional trust, especially among people in countries with high levels of democracy.

Our findings align with previous literature that revealed a close connection between far-right or conservative views (Serrano-Alarcón et al. 2023; Wollebæk et al. 2022; Choi and Fox 2022; Motta 2021) and vaccine hesitancy, as well as research reporting that individuals not aligned with any party were more likely to resist vaccination (Spälti et al. 2023; Ward, Cortaredona, et al. 2024). It also confirms previous findings from Stoeckel et al., (2022) who found that anti-elite worldviews and culturally closed positions were linked to vaccine hesitancy, and those reported by Hornsey et al. (2021) who found that the most vaccine-hesitant group comprised respondents expressing strong liberal tendencies.

These results reflect the important transformations that many countries have faced with the rise of populist parties and movements, many of which have made criticism of regulatory bodies and experts in general a key part of their rhetoric (Merkley 2020). Indeed, as Gauchat and others have highlighted in the case of the US (Gauchat 2012; Motta 2021; Sorell and Butler 2022), the Republican party has progressively radicalised since the 1980s and increasingly endorsed antiscientific positions on issues such as vaccination and climate

change (see also Enders and Uscinski (2021; Uscinski et al. 2021)). Beyond the US, Huber et al. (2021) emphasise the spread of scientific populism on the right in many European countries (see also Hotez (2023a)). This politicisation confirms the failure of democracies to promote an "engaged distrust" (Warren 2018).

The evidence that people in the centre of the spectrum, including individuals with moderate views or apolitical ones, were more likely to be sceptical towards vaccines on average is concerning for several reasons. Firstly, the VAX scale sought opinions on vaccines in general, not just COVID-19 vaccines (which were accompanied by significant misinformation campaigns and suspicion). Secondly, those in the centre comprised a significant share of respondents in all countries: from 16% of the sample in Norway to 41% in Russia, and 23% on average. Reinforcing vaccine confidence for those in the political centre is a top public health priority to prevent an increased share of people losing confidence and potentially avoiding vaccination in the future. However, as these people position themselves in the centre of the political spectrum, they may not be interested in politics at all, or might report lower levels of trust towards politicians and public authorities due to disenchantment with politics which have been found to be associated with hesitancy (Ward, Cortaredona, et al. 2024). Accordingly, even an extensive public health campaign administered by public authorities may not produce a significant effect on them.

Improving trust towards public health authorities in these groups might overcome the political disenchantment barrier. Indeed, we have found trust to be the determinant consistently explaining the largest variation observed in vaccine attitudes. Adding trust to our models resulted in significant improvements in the goodness of fit, confirming previous evidence from the US (Hegland et al. 2022). The independent effect of trust in PHA from political orientation is our most relevant finding as it is statistically significant and observed across all contexts (except India), strongly confirming previous evidence (Choi and Fox

2022; Wollebæk et al. 2022; Stoeckel et al. 2022; Mesch and Schwirian 2015; Lazarus et al. 2021; Hegland et al. 2022; Dubé et al. 2013; Ward, Cortaredona, et al. 2024). Nevertheless, prior research has also shown that political leanings can shape perceptions of and confidence in health experts (Motta 2021), with trust mediating the relationship between political ideology and vaccination attitudes. The strong associations we observe between trust and vaccine acceptance may partly reflect the politicization of trust itself. The limitations of cross-sectional data and time-invariant measures hinder our ability to fully disentangle these dynamics. Future studies using longitudinal or experimental designs could clarify how political leanings influence trust and, in turn, vaccine acceptance.

The role of trust in shaping vaccine attitudes underscores its broader importance in healthcare, particularly in facilitating effective communication and information exchange between health policymakers, healthcare workers, and the public (Akerlof 1970). However, trust had relatively less of a role in explaining variation in individuals' VAX scores in countries with lower levels of democracy. This may be attributable to the general lower confidence (or valuation of trust) that respondents in non-democratic countries have versus their political institutions as a result of the lack in transparency, accountability, and public deliberation (Andrain and Smith 2006; Willison et al. 2023). This result should be confirmed in future research as our estimate could be influenced by the significant different sample size across democracy groups. Improvements in explanatory power were greater in all the ex-communist countries (>20 percentage points) and Italy (25 percentage points).

While the current finding is not novel, the evidence that trust is a key predictor of vaccine attitudes across all countries provides important policy implications at national and international levels. Indeed, even if political orientation is an important predictors for vaccine hesitancy, our results suggest that national and international public health bodies should build

(or re-build) trust across political groups, also targeting individuals outside the common political spectrum (i.e., apolitical) (Choi and Fox 2022; Ward et al. 2020).

How to do so is context-dependent, and a specific investigation of the roots of mistrust should be conducted across subgroups of national populations. However, reducing inequalities and reinforcing social capital can be a global policy, given the significant evidence of a socioeconomic gradient characterizing vaccine hesitancy (Klymak and Vlandas 2022; Dubé et al. 2013). This is also reinforced by the evidence that more politically sophisticated individuals, who are typically the more educated and wealthy, are less likely to be vaccine hesitant irrespective of their political affiliation (Matthew J. Hornsey et al. 2021; Ward, Cortaredona, et al. 2024; Pennycook, Bago, and McPhetres 2023).

Limitations

Our study has several limitations. First, utilising online platforms and quota sampling for age, gender, and geographical location may have introduced selection bias in the sample given the exclusion of relevant groups for vaccine attitudes (i.e., low-income people, those without an internet connection, migrants, etc.). Such exclusion might potentially bias the results in unclear directions. Additionally, quota sampling may introduce additional bias because a correlation between willingness to participate in the survey and attitudes toward vaccination may exist. Other concerns relate to the potential presence of so-called speeders, who may answer without paying much attention to the questions. Speeders were defined as those taking less than 40% of the median completion time in their country and were excluded during the survey period. Additional checks by panel operators used personal information and profiling data to detect anomalies, such as spikes in users with similar demographics, IP ranges, or completion times.

In terms of data, we only had cross-sectional data and were not able to follow the respondents over multiple years. Accordingly, our study was only able to detect correlation and not causation. Further analysis over multiple years is required to address this limitation. Moreover, most countries included in our study are high-income. This restricted sample may limit the generalizability of our results to low-income countries. Future research should extend this comparative analysis to low- and middle-income countries or countries with more heterogenous political systems, levels of democracy and healthcare systems trustworthiness (Larson et al. 2018).

Finally, we measured political orientation using a left-right scale, a standardised method that facilitates cross-country comparisons but has well-documented limitations. These include variations in how respondents interpret abstract political concepts (Bauer et al. 2017). A more pressing issue in our study is the lack of data about which political party, if any, respondents voted for. This information would enable us to assess whether affiliation with populist parties, rather than political orientation alone, is linked to higher vaccine scepticism. Future research should also consider whether the presence of populist parties/leaders could be more important than democracy per se in shaping individuals' vaccination attitudes.

Conclusion

Our findings indicate that the presence of democratic institutions is not sufficient to boost vaccine uptake. The impact of political orientation on vaccination behaviours is context-dependent, suggesting generalizable trends for countries with similar institutional features. Trust towards public health authorities explains the largest variation in vaccination attitudes. Accordingly, politicians should attempt to de-politicise vaccines and vaccination campaigns while working to reinforce the population's trust in science, scientific information, and technical bodies (Ward, Cortaredona, et al. 2024; Numerato, Honová, and Sedláčková 2021).

In this context, vaccination mandates may only represent a shortcut to achieving short-term outcomes but might not be as effective in the long-run to build stable vaccine confidence (Karaivanov et al. 2022; Dubé et al. 2021), because they change behaviours without changing hearts and minds (Attwell and Smith 2018). Governments should educate the public about the stringent regulation imposed on vaccines' production, and improved communication campaign framed on positive and easily understandable messages (Betsch et al. 2017; Habersaat et al. 2020). Most importantly, educational campaigns should be initiated in schools to emphasise the importance of preventive health behaviours, with vaccines being a key component.

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