A fuzzy-set qualitative comparative analysis of how corruption, education, inequality and trust in parliament affect voter-turnout

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Abstract
This article empirically examines whether corruption, education, inequality, and trust in parliament affect voter turnout in countries that are members of the Organization for Economic Co-operation and Development. Specifically, fuzzy-set Qualitative Comparative Analysis is used to determine whether these factors (individually or in combination) are necessary or sufficient conditions for high or low voter turnout. To date, this method has never been applied to the study of voter turnout and this study attempts to fill this gap. The main conclusion is that corruption harms democracy by lowering voter turnout. The analysis also provides evidence that trust in parliament affects political participation and that the persistence of low educational attainment in a country, together with high inequality, is a sufficient condition for low turnout. Overall, the results suggest the importance of fighting corruption for citizen participation in democracy. They also show that measures to increase turnout should combine improvements in democratic institutions, education, and distributive justice.

Introduction

Voter turnout has been studied extensively since the advent of the rational choice question - why do people vote at all (Downs, 1957). In fact, the chance that a person will change the outcome of an election is virtually zero. In the cost-benefit calculus

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of citizens, therefore, no one should vote no matter how much he or she cares, i.e., the strength of preference as such is virtually irrelevant. Given the difficulties of the rational model in explaining turnout, many arguments have emerged in recent decades that attempt to understand the determinants of voter turnout (Cancela & Geys, 2016; Martins & Veiga, 2013). In a meta-analysis of 130 journal articles, Stockemer (2017) identified over a hundred explanatory factors for voter turnout. Frank and Coma (2021) identified 127 different independent variables that may influence turnout. The existence of a large number of possible factors affecting turnout makes it very difficult to draw solid empirical conclusions, as Frank and Coma (2021, 1) note: "Despite decades of research, there is no consensus on the central correlates of turnout at the national level." According to Blais and Dobrzynska (1998: 241), studies of voter turnout can be categorized by different types of factors, such as "socio-economic environment, the constitutional setting, and the party system."

This study focuses exclusively on the socioeconomic dimension and aims to understand how four elements of the national socioeconomic environment that have received much attention from scholars influence voter turnout. The four causal factors that are analysed and expected to influence voter turnout are: *corruption* (e.g., Dahlberg & Solevid, 2016; Stockemer, 2013; Stockemer et al., 2011); *education* (e.g., Ahlskog, 2021; Burden, 2009; Persson, 2013a); *inequality* (e.g., Stockemer & Scruggs, 2012; Matsubayashi & Sakaiya, 2021; Wilford, 2020); and *trust in parliament* (e.g., Grönlund & Setälä, 2007; Hadjar & Beck, 2010; Hooghe & Marien, 2013).

Specifically, the goal is to find out whether corruption, education, inequality, and trust in parliament (individually or in combination) are necessary or sufficient conditions for high or low voter turnout in OECD countries. Fuzzy-set Qualitative Comparative Analysis (fsQCA) is used for this purpose. This method is based on Boolean logic and is useful for analysing how certain theoretically based factors might be necessary or sufficient conditions for an outcome. The use of fsQCA in the macro domain is well established in the social science literature (Roig-Tierno et al., 2017) and has several advantages (Pappas & Woodside, 2021). First, it accounts for multiple causality, i.e., it can predict different pathways (combinations of causal factors) leading to an outcome. Second, fsQCA accounts for non-symmetry, so that paths leading to high voter turnout may differ from paths leading to low voter turnout.

The fsQCA has never been applied to the study of voter turnout. Thus, this study fills a gap in the literature on voter turnout by allowing us to examine whether the causal conditions for high voter turnout are the same (inverse) or different from those for low voter turnout, what interactions (combinations) exist among the causal factors, and whether there are multiple causal explanations for the phenomenon.

The paper begins with a brief review of the literature on the four causal conditions included in the study, followed by a presentation of the empirical study and results. It then discusses the results and draws some conclusions.

Conditions that may influence voter turnout[1]

Corruption

Stockemer (2013: 190) refers to corruption as the "misuse of public office for private gains" and emphasizes that it "negatively affects individuals, municipalities, regions, countries, and the world as a whole." Lagunes (2012: 802) states that corrupt officials "weaken the democratic regime's legitimacy and place the entire social contract at risk." Some scholars who have studied the damage that corruption does to democracy (e.g., Drapalova et al., 2019; Kubbe & Engelbert, 2018) emphasize the deterrent effect of corruption on political participation. Stockemer et al. (2011) suggest that citizens who perceive political leaders to be corrupt often prefer not to vote because they believe their vote cannot change the corrupt environment. According to this view, corruption would produce a *demobilization effect*. More specifically, in a high corruption environment, citizens do not go to the polls because they believe that they cannot influence the behaviour of policy makers. These authors (2011: 76) note that citizens "stop considering elections as 'instruments of democracy' that are worth their time and effort."

Several studies take a different approach to explain demobilization in voter turnout, arguing that corruption undermines citizens' sense of civic duty to vote and consequently affects their turnout (e.g., Bowler & Donovan, 2013; Sundström & Stockemer, 2015). Feitosa (2020) confirms that perceived corruption is negatively related to citizens' sense of duty to go to the polls, but the relationship is weak.

Conversely, there are studies that suggest that corruption can promote political mobilization (*mobilization effect*). Two arguments could justify this effect. First, elections are an opportunity to punish politicians involved in corruption by supporting other candidates. Second, voters may also elect corrupt candidates because of clientelism, in which politicians trade votes for public goods (Stockemer, 2013: 191–192).

Empirical findings tend to support the *demobilization effect*: "Most of the existing literature suggests a negative relationship between corruption and voter turnout." (Stockemer et al., 2011: 77). Feitosa (2020) points out that the evidence for lower turnout in contexts with high corruption is preponderant. In support of the *mobilization effect*, Dahlberg and Solevid (2016: 490) point to five studies that conclude that corruption mobilizes citizens to vote, but they found that in countries with low to medium levels of system corruption "corruption negatively affects turnout." (Dahlberg & Solevid, 2016: 489).

There is also evidence of a weak or no relationship between corruption and voter turnout. For example, Stockemer (2013: 189) found that "corruption more narrowly defined as political corruption, stifles turnout, whereas a rather broad definition of corruption which includes societal and financial corruption has no impact on macro-level turnout."

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[1] Stating these conditions as causal does not preclude them from being moderators of the influence of other variables, such as citizens' values, the population's normative compliance, moral attitudes, and others that may influence both levels of corruption and voter turnout. Investigating these possibilities is beyond the scope of this study

As for clientelism, there is no empirical evidence of the mobilization effect.

In sum, the literature largely suggests a negative relationship between corruption and voter turnout.

Education

Burden (2009) and Persson (2013a) reviewed the literature on the relationship between education and voter turnout and found a link between the two, but in two opposite directions. First, they point to several studies advocating the *absolute education model*, which proposes that education has a direct causal positive effect on political participation. According to this approach, education increases civic skills, political knowledge, political interest, and efficacy, "It increases citizens' beliefs that they can effectively play a role in the political process." (Persson, 2013a: 690). The more education individuals have, the more likely they are to participate in politics, i.e., to go to the polls. Thus, according to the *absolute model of education*, the higher the education level of a country's population, the higher the voter turnout.

However, this view has been criticized (Nie et al., 1996; Tenn, 2005, cited in Burden, 2009: 542) with the argument that there is an indirect effect of education on political participation through social status. This approach is known as the *relative education model*. It assumes that individuals with higher social status are more likely to vote because they are exposed to networks where political knowledge is more widespread and accessible and social norms are strong (Ahlskog, 2021). This environment is conducive to participation. According to the *relative education model*, education should be viewed as a *positional good*, that is, something that is valuable to some people only on the condition that others do not have it. Education is the key to success in the world of work, and the more people acquire higher education, the lower the social status of a college degree becomes, as qualified people slide down the job hierarchy due to greater competition. This leads to a drop in social status. The loss of social status leads to lower political participation. As Persson (2013a: 693) notes, "the impact of education depends on the level of education in the environment." Thus, according to the *relative education model*, an increase in the share of the population with higher education can dampen overall political participation in a country.

The empirical literature reflects these conflicting theoretical views and shows a paradoxical relationship between education and voter turnout when comparing the micro to the macro level. (Ahlskog, 2021; Burden, 2009; Persson, 2013a). Many studies show that education at the individual level has a positive effect on voter turnout. On the other hand, higher levels of education at the macro level do not seem to increase overall political participation. For example, Borgonovi et al. (2010) and Hadjar and Beck (2010) find evidence for the *absolute education model*, i.e., education is positively related to voter turnout and information gathering about politics and current issues. Conversely, in a multilevel model testing the relationship between education and voter turnout with a sample of 37 countries, Persson (2013b) shows that the effect of *relative education* is important in aggregate data.

Overall, the way in which education affects turnout remains inconclusive.

Inequality

Stockemer and Scruggs (2012) examined the literature on inequality and voter turnout and, as with education, found two opposing theories. On one side is the *power theory*, which states that higher inequality lowers turnout. On the other side is the *conflict theory*, which predicts a positive relationship between inequality and turnout.

The *power theory* states that as inequality increases, the political participation of the poor decreases "because it becomes too difficult for them to have the issues they care about addressed by the political process." (Stockemer & Scruggs, 2012: 765). The *conflict theory* posits that a rise in inequality mobilizes the poor and the rich to vote because "greater income gaps exacerbate preferences for redistribution among the poor and the rich. This increases the two groups' possible gains and losses in elections giving citizens more incentives to turn out." (Stockemer & Scruggs, 2012: 766).

Solt (2010), Jensen and Jespersen (2017), Ritter and Solt (2019), and Wilford (2020) found evidence of a negative relationship between inequality and voter turnout. Stockemer and Scruggs (2012: 765) mention that *power theory* is the "perspective with the greatest empirical evidence." Schäfer and Schwander (2019: 407) affirm that "Across datasets and methods, we find a consistently negative effect of income inequality on turnout, with mostly statistically significant coefficients that strengthen confidence in the findings."

Oliver (2001), however, found that a larger gap between rich and poor increases turnout. His argument is the *negativity bias argument*: higher income inequality mobilizes low-income citizens but demobilizes high-income citizens to vote. Oliver's study claims that mobilization of the poor outpaces demobilization of the rich. Conversely, Solt (2008) found that higher levels of net income inequality demobilize low and middle-income people. In contrast, Matsubayashi and Sakaiya (2021: 14) point out that "The mobilizing and demobilizing effects of an increase in income inequality are similar in terms of sizes, which suggests that the overall level of turnout is unlikely to change dramatically as income inequality increases." The findings of Horn (2011), Stockemer and Scruggs (2012), and Stockemer and Parent (2014) support this view, as their studies find no correlation between inequality and turnout.

The debate over the impact of inequality on turnout continues. Broadly, Stockemer (2017: 712) concludes that "the influence of inequalities on turnout is inconclusive."

Trust in parliament

Grönlund and Setälä (2007) point out that according to Warren (1999: 349–350, cited in Grönlund & Setälä, 2007: 402), "trust in institutions requires that there is an agreement of the norms that constitute an institution and institutions are actually perceived to work according to these norms." In general, trust can be said to focus on how institutions meet people's normative expectations. Hadjar and Beck (2010) mention that the theoretical argument for the influence of trust on voter turnout can be found in Putnam (2000, cited in Hadjar & Beck, 2010: 527). According to this author, trust is the most important foundation of a democratic society: people vote when they trust that the political system will respond in some way to their voting behaviour. It is expected that a person who does not trust the institutions that make up the political

system will not be motivated to participate in political action (e.g., voting). Therefore, "a higher level of political trust (…) will increase citizens' likelihood to vote" (Wang, 2015: 292).

To capture the impact of trust in political institutions on voter turnout, there are studies that simultaneously include trust in several institutions, parliament, government, the judicial system, politicians, and measures of satisfaction with democracy, but the results show an overlap between these measures. For example, in Grönlund and Setälä (2007) study, trust in parliament was included with trust in politicians and satisfaction with democracy, but only trust in parliament had an expressive effect on turnout. Trust in politicians was not significant, and satisfaction with democracy had a very small effect on turnout.

The variable trust parliament may also capture the impact of economic conditions on turnout. Indeed, Park (2021) points to studies showing that trust in political institutions captures the impact of economic performance on turnout: "scholars cite rising political distrust (…) as evidence of the impact of macroeconomic conditions on turnout." (Park, 2021: 2).

Empirical evidence supports the positive relationship between trust in parliament and voter turnout. Grönlund and Setälä (2007: 418) concluded that there is "a clear and linear relationship between trust in parliament and turnout." Martin (2010), Hadjar and Beck (2010), and Hooghe and Marien (2013) also found that citizens with high levels of political trust are more likely to engage in political participation. Wang (2015: 292) mentions some studies that found a positive relationship between political trust and voter turnout, but also points to three studies that found no relationship. Nevertheless, most studies support the positive relationship.

Research questions

The purpose of this study is to determine whether and how corruption, education, inequality, and trust in parliament, individually or in combination, affect voter turnout in OECD countries. It seeks to answer specific research questions:

(i) to determine whether corruption, education, inequality, and trust in parliament are necessary or sufficient conditions for high or low turnout; (ii) to examine whether there are differences in causality between high and low turnout.

Method

Procedure

The methodology employed in this research is the fuzzy-set Qualitative Comparative Analysis (fsQCA), based on Ragin (2000, 2008). FsQCA uses Boolean algebra to implement principles of comparison in the qualitative study of macrosocial phenomena and is well established in the social science literature (Pappas & Woodside, 2021; Roig-Tierno et al., 2017).

With fsQCA, it is possible to find the necessary and sufficient conditions (pathways of causality) for a given outcome. Computer algorithms developed by electrical engineers in the 1950s provide techniques to simplify this type of data. In this study, the data were computed using the fsQCA 3.0 software package developed by Charles Ragin and Sean Davey, which uses the Quine-McCluskey algorithm.[2]

The fsQCA is a variant of the simple QCA. In the simple QCA method, membership in sets is based on a calibration of variables into categorical variables with values of "zero" or "one", depending on whether each case belongs to a set or not. In fsQCA, calibration allows gradations in set membership (continuous variables). Set membership is assigned on a scale from 0.0 (non-membership) to 1.0 (membership), with 0.5 being the crossover point or the point of maximum ambiguity. In this study, the data of the variables (sets) are calibrated in the range between zero and one, using as thresholds the percentiles 95 (full membership), 50 (central point); 5 (full non-membership): Values above 0.5 indicate membership in a particular set: the closer to percentile 95, the higher the degree of membership in the set; values below 0.5 indicate non-membership in a particular set: the closer to percentile 5, the higher the degree of membership in the negation (~) - logical complement - of the set; values near percentile 50 are points of maximum ambiguity. As mentioned by Choi and Cho (2018), percentiles are commonly used in fsQCA studies: "one general method used for calibration is by using three anchor values (percentiles 0.95, 0.5, and 0.05) to convert raw data to fuzzy score." (Choi & Cho, 2018: 4417). This approach is appropriate when there is no clear theoretical or empirical knowledge on how to determine the midpoints (points of maximum ambiguity) of fuzzy membership scores. Indeed, there is no theoretical or empirical guidance on what values for voter turnout, corruption, education, inequality, and trust in parliament should be in the grey area between "in" (belonging to the set) and "out" (belonging to the logical complement of the set).

The fsQCA uses the term *causality* within Boolean logic. It should be noted that no statistical causality tests are performed. The procedure is to determine the extent to which a given set contains or is contained in the other set.

A condition is necessary if it is present in all instances of the outcome, and it is sufficient if a given outcome occurs when the condition is present (Ragin, 2000). For example, condition A is necessary for outcome K if in every case the degree of membership in A is consistently greater than or equal to the degree of membership in K (K is a subset of A).[3]

Condition A (or a combination of conditions, e.g., B and C) is sufficient for K if in all cases the membership in condition A (or in the combination B and C) is consistently less than or equal to the membership in K (A is a subset of K). For example, *high level of education of the population* is a necessary condition for *high voter turnout* if, considering all cases (countries), membership in the set *high level of education of the population* is consistently greater than or equal to membership in the set *high*

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[3] Combinations of conditions are not considered in the study of necessary conditions because logical *and* (combination) is obtained by taking the minimum membership score of each case in the sets that are combined. If individual conditions are not necessary conditions, then neither is a combination of these conditions.

voter turnout. The validation of the results is based on *consistency*. Consistency indicates the extent to which the cases that belong to a particular condition also belong to the outcome. If the consistency of a condition (or combination of conditions) is low, it is not supported by empirical evidence. According to Fiss (2011), the consistency of a condition must be at least 0.9 (i.e., 90%) to be considered a necessary condition, and the consistency of a condition (or combination of conditions) must be at least 0.75 (i.e., 75%) to be considered a sufficient condition. Ragin (2008) also suggests that for the fsQCA solutions (that include all pathways leading to the outcome), the consistency must be higher than 0.75 (75%).

Not only consistency, but also *coverage* is important in fsQCA. It refers to the number of cases for which a configuration of conditions is valid. Unlike consistency, the fact that the coverage of a configuration is low does not mean that it is less relevant: "In cases where a result occurs through multiple causal configurations, a single configuration can have low coverage but nevertheless be useful to explain a set which causes a particular outcome." (Roig-Tierno et al., 2017: 17). However, according to Ragin (2000), a value of more than 0.5 (50%) is appropriate for the solution coverage (coverage of all pathways leading to the outcome).

The fsQCA offers three solutions: the *complex solution*, the *intermediate solution*, and the *parsimonious solution*. The *solution* refers to "a combination of pathways supported by a high number of cases for which the rule 'the combination leads to the outcome' is consistent" (Pappas & Woodside, 2021: 11). The intermediate solution is part of the complex solution and includes the parsimonious solution. Thus, the parsimonious solution represents the *core* conditions that cannot be omitted from any solution. The complex and parsimonious solutions are calculated without simplifying assumptions.

The complex solution is limited, because it excludes all counterfactual combinations (*remainders*, i.e., the combinations of conditions with no case member, all set to false in the complex solution). This limitation is greater when the number of cases is relatively small, as is the case in this study.

The parsimonious solution includes all possible counterfactual combinations that can contribute to a logically simpler solution, regardless of theoretical cues (it includes remainders that are in harmony with theoretical and empirical knowledge-*easy counterfactuals*-and also *difficult counterfactuals*).

The intermediate solution also incorporates remainders, but only those that are plausible counterfactuals (*easy counterfactuals*). Ragin (2008) recommends using the intermediate solution when theoretical or empirical guidance is available, which is the case in this study. Intermediate solution uses theory-based assumptions (about how a condition contributes to the outcome). It "is based on information about the causal conditions that the user inputs based on his or her substantive knowledge." (Ragin, 2008: 144). Two assumptions inspired by previous findings in the turnout literature were included in this study: a negative relationship between corruption and voter turnout, and a positive relationship between trust in parliament and voter turnout. The introduction of these two assumptions into the algorithm allows for the identification of the easy counterfactuals.

Regarding education and inequality, as described above, there are inconclusive empirical results and conflicting theoretical views on their influence on turnout at the

national level. Therefore, the fsQCA intermediate solution does not include assumptions about these relationships.

According to Fiss (2011), the combination of the parsimonious and intermediate solutions provides a clearer and more detailed view of the results: The *core* conditions are included in the parsimonious solution, and the *core* and *peripheral* conditions are included in the intermediate solution.[4]

Some examples of fsQCA applications in OECD countries are Choi and Cho (2018), Giner et al. (2019) and Madanipour and Thompson (2020).

Models

Given the possibility of asymmetry allowed by the fsQCA method, the necessary and sufficient conditions for high and low turnout were examined separately.

The models are:

$$Vote = f \left(Corruption; Education; Inequality; Trust \right) - \text{(high voter turn out model)}$$

$$Vote = g \left(Corruption; Education; Inequality; Trust \right) - \text{(low voter turn out model)}$$

Research cases

The sample of this study includes 29 OECD countries.[5] For reasons of comparability, countries with compulsory voting are not taken into account.[6] Colombia is a member of the OECD but is excluded because it will not become a member of the organization until 2020. There are major differences among OECD members, as Castles and Obinger (2008) point out, but they share a common reference: they are committed to democracy, the market economy, and OECD policy standards. There are several studies on electoral participation that refer to OECD countries (e.g., Blais & Carty, 1990; Grönlund & Setälä, 2007; Jackman & Miller, 1995; Schäfer & Schwander, 2019).

Measures

Voter turnout (VOTE) is measured by the average turnout in two electoral contests between 2012 and 2022 (as a percentage) using data from the voter turnout database

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[4] The tables ahead show the results of the *intermediate solution*, with the *core* conditions in bold representing the *parsimonious solution*.

[5] Austria, Canada, Chile, Czechia; Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, South Korea, Spain, Sweden, United Kingdom, United States. Four states provide for compulsory voting (Austria, Finland, Italy and Sweden), but the practice is weakly enforced or not at all, thus in all these countries voting is effectively voluntary.

[6] Australia, Belgium, Costa Rica, Greece, Luxembourg, Mexico, Switzerland, and Turkey are not included in the sample because they have or recently had compulsory voting. Some of these countries have compulsory only in some states (e.g., Switzerland).

provided by IDEA - Institute for Democracy and Electoral Assistance.[7] There are several studies of voter turnout that use this source (e.g., Stockemer & Scruggs, 2012; Stockemer, 2013). With some exceptions, data refer to the percentage of eligible adult citizens who voted in national parliamentary elections in their country. Presidential elections were included for countries where the president plays a central role in political decision-making.[8]

Corruption is calculated using the Corruption Perceptions Index (CPI) of the Transparency International Organization for 2018.[9] CPI refers to the perception of corruption levels by experts, like business people and risk analysts.[10] This measure captures both grand and petty corruption. According to Kaufmann et al. (2007: 3), "perceptions matter because agents base their actions on their perceptions, impressions, and views." The authors argue that it is not the actual level of corruption that matters, but how individuals perceive corruption that influences people's behaviour. CPI is one of the most common and well-known indicators for assessing the phenomenon of corruption. The use of direct measures of corruption is likely to lead to an underestimation of the extent of corruption, as detection and conviction of criminals is difficult given the sophisticated nature of the crime. Much depends on the effectiveness of a country's judicial system, and there is wide variation across countries on this issue. Therefore, perceptions are often used in the literature as indicators of the extent of corruption in a country.

According to CPI, the perception of corruption in countries varies from 0 (highly corrupt) to 100 (very clean of corruption). Since the variable is reversed, i.e., the higher the value of CPI, the lower the level of corruption, in this study the set of data on corruption is referred to as NOCORRUPTION (with the logical complement ~ NOCORRUPTION, meaning a high level of corruption).

Education (EDUCATION) is measured by *gross enrolment ratio in tertiary education* that is the ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. It is expressed in percentage. This indicator is published by the World Bank in World Development Indicators.[11] It is suitable for measuring the relative influence of education based on competition for a tertiary education qualification (*relative education model*), which, as noted above, influences the level of social status it can provide. It also captures the educational level of a country (*absolute education model*), since tertiary education, whether or not it is an advanced research qualification, usually requires successful completion of secondary education as a minimum requirement for admission. The data were collected for the year 2018.

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[7] https://www.idea.int/. Accessed 09 August 2022.

[8] Chile, France, South-Korea and United States.

[9] https://www.transparency.org/en/cpi/2020. Accessed 09 August 2022.

[10] A more accurate measure of corruption in the context of electoral participation could be based on household perceptions of corruption, such as the Global Corruption Barometer or the World Values Survey, but these surveys do not cover all OECD countries. However, De Vries and Solaz (2017, 395) point out that "people's average corruption perceptions are positively correlated with more objective summary measures of corruption."

[11] https://datatopics.worldbank.org/world-development-indicators/. Accessed 09 August 2022.

The measure of *inequality* (INEQUALITY) is the Gini coefficient calculated in the Standardized World Income Inequality Database (SWIID) by Solt (2020).[12] The data were collected for the year 2018.[13] SWIID combines existing data on income inequality from different countries to produce comparable Gini indices of disposable and market income inequality at the national level for about 200 countries. A Gini index of 0 represents perfect equality, while an index of 100 represents maximum inequality. As noted by Stockemer and Scruggs (2012: 766–767), many studies use the Gini coefficient as a proxy for the degree of inequality in a country: "The measure of inequality is the Gini coefficient, which is relied upon in almost all of the turnout studies we reviewed." Stockemer and Scruggs (2012: 767) explain the advantage of using the Gini coefficient from the SWIID dataset: "We prefer the net Gini concept, because the main mechanisms leading inequality to affect turnout are more likely to operate via people's disposable incomes (i.e., post taxes and transfers) than via their market income." Matsubayashi and Sakaiya (2021) also use the Gini coefficient from the SWIID dataset in their study of the impact of inequality on turnout.

Trust in parliament is measured by the answers to a question[14] in the World Values Survey (S7) and European Values Survey (2017) questionnaires, the results of which can be found in the joint EVS/WVS 2017–2021 dataset.[15] The level of trust in parliament is derived from the percentage of respondents who answered *no confidence at all* in parliament (class 1). For Ireland and Israel, the only available source is the European Social Survey (ESS) - for Ireland ESS Round 9 and for Israel ESS Round 8 - which contains the same question, but the answers are categorized between 0 and 10, with 0 "No trust at all" and 10 "Complete trust".[16] Comparing the results from ESS and from EVS/WVS for all countries included in both surveys, it appears that the best comparability between EVS/WVS (4 classes) and ESS (10 classes) for the specific question in the analysis is when the percentage calculated in ESS is the sum of the three lower positions of the scale. The data are collected for the years 2017 to 2020. According to the definition of the variable, the higher the percentage of respondents who expressed no confidence at all, the lower the trust in parliament. Thus, the variable is reversed and is therefore called NOTRUST (the logical complement is ~NOTRUST, which means a high level of trust in parliament).

Grönlund and Setälä (2007), Hadjar and Beck (2010), Hooghe and Marien (2013) have developed similar measures of trust in parliament.

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[12] SWIID Version 9.1, May 2021: https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:https://doi.org/10.7910/DVN/LM4OWF. Accessed 09 August 2022.

[13] 2017 for Chile and Iceland.

[14] "How much confidence you have in parliament: is it a great deal of confidence, quite a lot of confidence, not very much confidence or none at all?" Responses are divided into classes 1 to 4 (with 4 - a great confidence and 1 no confidence at all).

[15] Joint EVS/WVS 2017–2021 Dataset (Joint EVS/WVS). GESIS Data Archive, Cologne. ZA7505 Data file Version 2.0.0. https://doi.org/10.4232/1.13737. Accessed 09 August 2022.

[16] Data for Ireland and Israel from European Social Survey rounds 9 and 8, respectively. https://www.europeansocialsurvey.org/data/. Accessed 09 August 2022.

Calibration thresholds

As mentioned earlier, fsQCA requires calibration, i.e., a decision about how to define membership in sets. As described above, data were calibrated in the range between zero and one, using as thresholds the percentiles 95 (full membership), 50 (central point); 5 (full non-membership). After calibration, values above 0.5 indicate membership in a given set; values below 0.5 indicate non-membership in a given set; values near 0.5 are points of maximum ambiguity. The anchor values for the calibration of the sets (variables) can be found in Table 1.

Data for the sets (variables) and calibrated data are in the Appendix.

Results

Necessary conditions

Table 2 shows that the consistency of all conditions is less than 0.9. Thus, none of the conditions is a necessary condition for high or low voter turnout. This implies that high or low voter turnout in OECD countries is not necessarily due to levels of corruption, education, inequality, or trust in parliament. Thus, explaining voter turnout is not limited to the causal conditions listed in Table 2; other factors may also contribute to its understanding. Examining such factors is beyond the scope of this study.

Table 1 Sets and fsQCA calibration thresholds

SETS	Full membership – percentile 95	Central point- percentile 50	Full non-membership – percentile 5
VOTE	83.545	68.095	51.576
NOCORRUPTION	86.2	72	50.8
EDUCATION	92.25971832	73.1032486	54.73707352
INEQUALITY	37.68	29.8	24.44
NOTRUST	33.8	16.3	5.72

Table 2 Necessary conditions for membership in high / low voter turnout

Sets	Outcome: HIGH VOTER TURNOUT		Outcome: LOW VOTER TURNOUT	
	Consistency	Coverage	Consistency	Coverage
High NOCORRUPTION	0.73	0.78	0.45	0.46
Low NOCORRUPTION	0.49	0.49	0.74	0.74
High EDUCATION	0.70	0.67	0.58	0.53
Low EDUCATION	0.51	0.56	0.64	0.67
High INEQUALITY	0.56	0.58	0.69	0.68
Low INEQUALITY	0.70	0.70	0.58	0.55
High NOTRUST	0.55	0.58	0.72	0.72
Low NOTRUST	0.74	0.74	0.58	0.55

Sufficient conditions

One of the main objectives of this study is to identify the sufficient conditions for high and low voter turnout using the methodology fsQCA. As mentioned earlier, the results are presented for the *intermediate solution*, which allows the inclusion of assumptions through theoretical and empirical guidance. In addition, the conditions included in the *parsimonious solution* (which does not depend on prior assumptions) are presented in bold in the tables. As mentioned earlier, the assumptions included in the *intermediate solution* are a negative relationship between corruption and voter turnout and a positive relationship between trust in parliament and voter turnout. No assumptions were made about education and inequality because, as noted above, the theoretical and empirical results are ambiguous about the direction of their relationship with turnout.

Table 3 shows the analysis of sufficient conditions for high voter turnout.

As shown in Table 3, the sufficiency analysis identifies only one pathway that is a sufficient condition for high voter turnout. A low level of corruption combined with a high level of trust in parliament is a sufficient condition for high turnout. According to the *parsimonious solution* of fsQCA, a low level of corruption is a sufficient condition for high turnout in a country.

Table 4 shows three different pathways to low voter turnout. First, low education combined with high inequality is a sufficient condition for low turnout. Second, high corruption combined with high inequality is a sufficient condition for low turnout. Third, high corruption combined with low trust in parliament is a sufficient condi-

Table 3 Sufficient conditions for membership in high voter turnout

Pathways	Raw coverage	Consistency	Member cases
NOCORRUPTION*~NOTRUST	0.656817	0.823232	Sweden (0.94,0.97), New Zealand (0.93,0.92), Norway (0.93,0.87), Denmark (0.84,0.97), Netherlands (0.76,0.91), Austria (0.7,0.87), Iceland (0.7,0.92), Germany (0.63,0.83)

The prefix '*' denotes "and"; '~' means low membership in a set ('low'). In **bold** the conditions that incorporate the *parsimonious solution*. The numbers in parentheses after the name of each member case represent the Fuzzy Score for the combination of conditions represented in each pathway (membership in the pathway), followed by the Fuzzy Score for the outcome (membership in the outcome).; Assumptions: low corruption, high trust in parliament. Technical Notes: Frequency Cutoff: 1.0; Consistency Cutoff: 0.765625; Solution Coverage: 0.656817; Solution Consistency: 0.823232

Table 4 Sufficient conditions for membership in low voter turnout

Pathways	Raw coverage	Consistency	Member cases
~EDUCATION*INEQUALITY	0.460666	0.748848	Japan (0.75,0.92), Portugal (0.72,0.94), Estonia (0.58,0.68), Canada (0.55,0.64)
~NOCORRUPTIONINEQUALITY	0.570517	0.757291	Latvia (0.87,0.89), Lithuania (0.86,0.97), Portugal (0.72,0.94), Chile (0.67,0.96)
~NOCORRUPTION*NOTRUST	0.656981	0.769933	Czechia (0.86,0.71), Poland (0.85,0.89), Slovenia (0.85,0.95), Hungary (0.79,0.6), Portugal (0.7,0.94), Chile (0.67,0.96), Slovakia (0.62,0.72), Lithuania (0.56,0.97)

The prefix '*' denotes "and"; '~' means low membership in a set ('low'). In **bold** the conditions that incorporate the *parsimonious solution*. The numbers in parentheses after the name of each member case represent the Fuzzy Score for the combination of conditions represented in each pathway (membership in the pathway), followed by the Fuzzy Score for the outcome (membership in the outcome).; Assumptions: high corruption, low trust in parliament. Technical Notes: Frequency Cutoff: 1.0; Consistency Cutoff: 0.803333; Solution Coverage: 0.8618; Solution Consistency: 0.757161

tion for low turnout. According to the *parsimonious solution*, high corruption is a sufficient condition for low turnout (there is symmetry between high and low voter turnout in terms of the influence of corruption) and the combination of low education and high inequality is a sufficient condition for low turnout.

Overall, there is some asymmetry between the conditions that affect high turnout and those that affect low turnout, since education and inequality only condition low turnout.

Discussion

This study begins with a brief overview of four causal conditions that the literature suggests have a significant impact on voter turnout - corruption, education, inequality, and trust in parliament. Then, a macro-level empirical study is developed using the fsQCA methodology. This study pioneers the use of fsQCA to explain voter turnout.

The first research question of the study aimed to find necessary and sufficient conditions for high and low voter turnout in OECD countries. The results show that

none of the four causal conditions or their combinations are necessary conditions for high or low turnout.

As for the sufficient conditions, there are some interesting results. This analysis focuses mainly on the results of the *intermediate solution* of fsQCA, which contains two assumptions based on theoretical arguments and previous empirical results: a negative relationship between corruption and voter turnout and a positive relationship between trust in parliament and voter turnout. The *parsimonious solution* that does not depend on the previous assumptions is also presented. This solution shows the core conditions that cannot be omitted in any solution. If we compare the results of the two solutions, we can see that only trust in parliament is not part of the *parsimonious solution* (it is a *peripheral* condition). Thus, the presence of trust in parliament in pathways that are sufficient conditions depends on the assumption of a positive relationship with turnout.

The results point to only one causal pathway as a sufficient condition for high turnout (Table 3): a combination of low corruption and high trust in parliament. When citizens trust their parliament and perceive political leaders as not corrupt, they feel committed to democracy and go to the polls. The results also support the *demobilizing effect* of corruption on voter turnout, as high corruption is present in two pathways for low voter turnout (Table 4). That is, when corruption is high, citizens tend not to go to the polls. Since corruption is part of both the *intermediate solution* and the *parsimonious solution*, its causal effect on voter turnout is highly significant. It can be concluded that corruption is a major enemy of democracy and that it is crucial to prevent and fight it. This conclusion is reinforced by the results for trust in parliament, as it interacts with corruption as a sufficient condition for both high and low turnout. This result confirms the literature that argues that corruption affects voters' trust in democracy by weakening citizens' trust in politicians (Bowler & Donovan, 2013; Caillier, 2010; Grönlund & Setälä, 2007; Hadjar & Beck, 2010; Stockemer et al., 2011; Sundström & Stockemer, 2015).

Education and inequality are only part of the pathways that are sufficient conditions for low voter turnout. The results for education are consistent with the expectations of the *absolute education model*, i.e., an increase in tertiary education levels has a positive effect on political participation. It seems that people with higher levels of education believe they can play a role in the political process (Persson, 2013a).

As for inequality, this study provides evidence for the *power theory*, as high inequality is part of the sufficient conditions for low voter turnout. This suggests, as Stockemer and Scruggs (2012, 765) note, that the poor feel "that it becomes too difficult for them to have the issues they care about addressed by the political process". Therefore, they do not go to the polls.

Regarding the second research question, it can be concluded that there are some differences in causality between high and low voter turnout (asymmetry), as education and inequality are only part of the sufficient conditions for low voter turnout.

A more detailed overview of the results, reveals that the countries included in the pathway for high voter turnout (Table 3) are highly developed countries. In contrast, in the three pathways for low turnout (Table 4) almost all are less developed. This is not the case for Japan and Canada, two highly developed countries that are *member cases* of a pathway for low turnout that combines low tertiary education enrol-

ment rate with high inequality. Table 6 (in the Appendix) shows that Japan has very low turnout (0.08), high inequality (0.75), and very low tertiary education enrolment rate (0.18). Canada, also has low turnout (0.36), not very high inequality (0.55), and higher tertiary education enrolment rate than Japan but relatively low in the sample (0.38). Both countries have low corruption, especially Canada (0.87 vs. 0.55, values in NOCORRUPTION). The results for these two countries call for an in-depth study of their situation. They underscore the need to pay special attention to their educational systems and, in the case of Japan, to the problem of social inequality.

Another country that stands out in Table 4 is Portugal, because it is the only country that is a *member case* of the three pathways for low turnout. This means that it will be very difficult to increase turnout in Portugal as this will require at the same time stronger control of corruption, measures to reduce inequality, investment in higher education, and more credible political leadership. According to Ferraz and Finan (2008), a country facing such a situation, while calling for greater control of corruption and greater trust in political institutions, could benefit from the creation of mechanisms that ensure greater transparency of information and greater independence of the media, as this would prevent the election of corrupt politicians.

These findings highlight the value of information and the role of the media in reducing informational asymmetries in the political process, thus enabling voters to not only hold corrupt politicians accountable but also to reward non-corrupt politicians.

Conclusion

The main conclusion of this study is that corruption harms democracy by lowering voter turnout. The study also shows that trust in parliament, education, and inequality affect voter turnout. There are some policy implications from the findings. Countries with high voter turnout must continue to fight corruption and ensure that democracy functions according to citizens' normative expectations of politics. Countries with low turnout are challenged to either fight corruption and improve democratic institutions, but also need to invest in expanding tertiary education and increasing distributive justice.

Overall, this study highlights the extreme importance of fighting corruption for citizen participation in democracy and sheds light on several new aspects of electoral participation compared to the existing literature. First, the results show that the causal conditions for high voter turnout may be different from the causal conditions for low voter turnout, as shown by the fact that levels of inequality and education are part of the sufficient conditions for low voter turnout but not part of the sufficient conditions for high voter turnout. Second, the explanation for the level of voter turnout relies on combinations of conditions (all validated causal pathways consist of combinations of conditions). This implies that measures to increase turnout should not be considered in isolation, but should combine improvements in several institutional dimensions, namely democratic institutions, education, and distributive justice. If policymakers ignore the interactions that exist, they risk missing their targets. Finally, low voter

turnout is associated with several causal configurations, implying that there are multiple explanations for this phenomenon.

A limitation of the study beyond those of the fsQCA described in Roig-Tierno et al. (2017: 17–18) is that generalizing the results to countries other than the OECD should be done with caution because the analysis is qualitative, i.e., based on cases. Another limitation of the study stems from the fact that it is a macro-level study and the indicators are very general and under-densified.

Appendix

Table 5 Data sets

COUNTRIES	VOTE	NOCORRUPTION	EDUCATION	INEQUALITY	NOTRUST
Austria	77.795	76	86.68834686	27.8	8.4
Canada	64.95	81	70.11302185	30.3	12.9
Chile	51.17	67	90.8963089	45.8	35.4
Czechia	63.115	59	63.76876831	24.4	38.5
Denmark	85.245	88	81.18334961	26.9	10.4
Estonia	63.95	73	70.36543274	30.7	15.4
Finland	67.79	85	90.2617569	26	10.7
France	77.455	72	67.54351807	29.8	23.4
Germany	76.365	80	70.34264374	29.6	14.4
Hungary	65.755	46	50.30653	27.9	24.1
Iceland	80.645	76	73.1032486	24.6	10.7
Ireland	63.93	73	77.28288269	29.5	11.8
Israel	69.48	61	61.47687149	34.4	21.9
Italy	74.06	52	64.29161835	33.7	22.9
Japan	54.315	73	63.80704117	32.7	11.8
Latvia	56.69	58	93.02448273	34.8	8.1
Lithuania	49.22	59	73.7303009	36	17.7
Netherlands	80.32	82	87.09784698	27.3	12.3
New Zealand	80.995	87	82.98303223	32.9	7.4
Norway	77.69	84	83.01725769	25.8	3.5
Poland	56.33	60	68.62010193	29.2	31.4
Portugal	53.265	64	65.66265869	32.3	21.2
Slovakia	62.815	50	45.36722946	23	19.1
Slovenia	52.185	60	77.11312103	24.5	26.5
South Korea	77.14	57	95.864151	33.3	27
Spain	70.8	58	91.11257172	32.8	23.4
Sweden	86.495	85	72.46116638	26.4	4.6
United Kingdom	68.43	80	61.38288879	31.7	16.3
United States	68.095	71	88.29917908	38.8	23.6

Table 6 Calibrated data

COUNTRIES	VOTE	NOCORRUPTION	EDUCATION	INEQUALITY	NOTRUST
Austria	0.87	0.7	0.89	0.25	0.1
Canada	0.36	0.87	0.38	0.55	0.28
Chile	0.04	0.33	0.94	1	0.96
Czechia	0.29	0.14	0.18	0.05	0.98
Denmark	0.97	0.97	0.78	0.16	0.16
Estonia	0.32	0.55	0.39	0.58	0.44
Finland	0.49	0.94	0.94	0.11	0.17
France	0.86	0.5	0.29	0.5	0.77
Germany	0.83	0.84	0.39	0.47	0.37
Hungary	0.4	0.02	0.02	0.26	0.79
Iceland	0.92	0.7	0.5	0.05	0.17
Ireland	0.32	0.55	0.66	0.46	0.22
Israel	0.57	0.17	0.13	0.85	0.72
Italy	0.76	0.06	0.19	0.82	0.76
Japan	0.08	0.55	0.18	0.75	0.22
Latvia	0.11	0.12	0.96	0.87	0.09
Lithuania	0.03	0.14	0.52	0.91	0.56
Netherlands	0.91	0.89	0.9	0.2	0.24
NewZealand	0.92	0.96	0.82	0.76	0.07
Norway	0.87	0.93	0.83	0.1	0.03
Poland	0.11	0.15	0.32	0.42	0.93
Portugal	0.06	0.24	0.23	0.72	0.7
Slovakia	0.28	0.04	0.01	0.02	0.62
Slovenia	0.05	0.15	0.65	0.05	0.85
SouthKorea	0.85	0.11	0.97	0.79	0.86
Spain	0.63	0.12	0.94	0.76	0.77
Sweden	0.97	0.94	0.47	0.13	0.03
UnitedKingdom	0.52	0.84	0.13	0.67	0.5
UnitedStates	0.5	0.46	0.92	0.97	0.78

Author contribution Research and Writing of the Paper.

Data Availability The data used in the empirical study are in the Appendix of the manuscript. In this way, the data are available in the article itself and accessible to anyone who reads it. The data sources are also indicated in the text, all of which are freely available to the public. All electronic addresses that provide direct access to the data at the source are also given in the text of the article.

Addresses where data can be obtained:

Voter turnout:

https://www.idea.int/. Accessed 09 August 2022.

Corruption Corruption Perceptions Index (CPI).

https://www.transparency.org/en/cpi/2020. Accessed 09 August 2022.

Education (gross enrolment ratio in tertiary education):

https://datatopics.worldbank.org/world-development-indicators/. Accessed 09 August 2022.

Inequality Gini coefficient calculated in the Standardized World Income Inequality Database (SWIID).

SWIID Version 9.1, May 2021: https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:https://doi.org/10.7910/DVN/LM4OWF. Accessed 09 August 2022.

Trust in parliament:

Declarations

Ethical approval The research underlying the manuscript complies with the ethical standards of scientific research and meets the requirements of the Ethics Committee of the institution where it was produced.

Competing Interests Not applicable. The author declares that there are no competing interests.

Informed Consent Not applicable.

Research involving human participants and / or animals Not applicable.

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