Rational voting in Portuguese local elections: A fuzzy-set analysis on how corruption, education, inequality and government efficacy affect voter turnout

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Abstract

The rational voter paradox — voting despite the minimal chance of influencing results — has inspired extensive research on electoral participation. In Portugal, low voter turnout raises doubts about democratic representativeness. This study examines the rationality of voting in Portuguese local elections, considering the influence of government efficacy, inequality, corruption, and education. Using fuzzy-set Qualitative Comparative Analysis, it concludes that different combinations explain turnout variation: corruption and poor governance mobilize voters, while inequality discourages participation. Thus, Portuguese electoral behavior appears relatively consistent with the rational voter theory.

Keywords: Rational voting; Local voter turnout; Corruption.

Voto racional nas eleições municipais portuguesas: uma análise «fuzzy-set» sobre como a corrupção, a educação, a desigualdade e a eficácia da governação afetam a participação eleitoral

Resumo

O paradoxo do eleitor racional — votar apesar da mínima probabilidade de influenciar resultados — originou muita investigação sobre a participação eleitoral. Em Portugal, a baixa participação eleitoral levanta dúvidas sobre a representatividade democrática. Este estudo analisa a racionalidade do voto nas eleições autárquicas portuguesas, considerando a influência da eficácia da governação, da desigualdade, da corrupção e da educação. Através

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da Análise Qualitativa Comparativa "fuzzy-set", conclui-se que diferentes combinações explicam a variação da participação: a corrupção e a má governação mobilizam o eleitorado e a desigualdade desmotiva-o. Assim, o comportamento eleitoral português mostra-se relativamente consistente com a teoria do eleitor racional.

Palavras-chave: Votação racional; Participação nas eleições autárquicas; Corrupção.

Vote rationnel lors des élections municipales au Portugal : une analyse «fuzzy-set» sur l'influence de la corruption, de l'éducation, des inégalités et de l'efficacité gouvernementale sur la participation électorale

Résumé

Le paradoxe de l'électeur rationnel — voter malgré la faible probabilité d'influencer les résultats — a suscité de nombreuses recherches sur la participation électorale. Au Portugal, la faible participation soulève des doutes sur la représentativité démocratique. Cette étude examine la rationalité du vote aux élections municipales, selon l'efficacité gouvernementale, les inégalités, la corruption et l'éducation. Grâce à l'analyse qualitative comparative «fuzzy-set», elle conclut que différentes combinaisons expliquent la variation de la participation: la corruption et la mauvaise gouvernance mobilisent les électeurs, tandis que les inégalités les découragent. Le comportement électoral portugais apparaît cohérent avec la théorie de l'électeur rationnel.

Mots-clés: Vote rationnel; Participation électorale locale; Corruption.

Voto racional en las elecciones municipales portuguesas: un análisis «fuzzy-set» sobre cómo la corrupción, la educación, la desigualdad y la eficacia gubernamental afectan la participación electoral

Resumen

La paradoja del elector racional —votar pese a la mínima probabilidad de influir en los resultados— ha generado investigación sobre la participación electoral. En Portugal, la baja participación plantea dudas sobre la representatividad democrática. Este estudio analiza la racionalidad del voto en elecciones municipales, considerando la influencia de la eficacia del gobierno, la desigualdad, la corrupción y la educación. Mediante el Análisis Cualitativo Comparativo "fuzzy-set", se concluye que distintas combinaciones explican la variación de la participación: la corrupción y la mala gobernanza movilizan, mientras la desigualdad desmotiva. El comportamiento electoral portugués resulta relativamente coherente con la teoría del elector racional.

Palabras clave: Voto racional; Participación electoral municipal; Corrupción.

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Introduction

The act of voting is the foundation of democracy, since by voting individuals express their preferences for the various proposals that will shape the public choice of communities. It is expected that voters are rational when voting. According to McGann (2016: 2), "a choice is rational if it is the best way of achieving a certain, logically consistent end." If the electorate does not vote rationally, democracy ceases to be a system of collective decision-making that corresponds to the preferences of the electorate. If voters do not choose rationally, it is not possible to punish or reward governments that move away from or closer to voters' preferences, as there are no criteria for accountability. The rational choice model of voting assumes that people make their voting decisions based on a consideration of the benefits and costs associated with voting (Downs, 1957). However, it is well known that voting in large elections cannot be explained by the selfish benefits of voting to the individual, as the probability of an individual's vote influencing the election is close to zero, meaning that the benefits of voting rarely exceed the costs. Nevertheless, "a majority of the voters do in fact vote" (Hansen, 1994: 6). The rational choice approach thus makes it difficult to understand why people vote at all (rational voter paradox). Given these difficulties, other arguments have emerged in recent decades that attempt to understand the determinants of voter turnout (Riker & Ordeshook, 1968; Aldrich, 1993; Blais, 2006).

Rational choice models generally assume that actors have instrumental preferences driven by selfish motivation. According to Edlin, Gelman and Kaplan (2007), to overcome the rational voter paradox, social motivations, such as social gratifications, should be added to the selfish benefits of the model when considering instrumental motives to vote. Rationality cannot be limited to the assumption of selfishness, because the act of voting can be rational on the basis of a social motivation, i.e., "the voter's judgment of the expected social consequences of the election outcome as distinct from the direct consequences to that voter" (Edlin, Gelman & Kaplan, 2007: 294). Edlin, Gelman, and Kaplan (2007: 293) "show that voting is rational even in large elections when individuals have 'social' preferences and care about social welfare". This calls into question the rational voter paradox. Based on this debate, this study examines

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the extent to which a combination of selfish and social motives influences voter turnout in local elections in Portugal.

This study focus on four factors (some are mainly self-interested, others are more socially motivated) that are known to be related to voter turnout not only in national elections (e.g. Cruz, 2023), but also in local elections: *government efficacy* (e.g. McDonnell, 2020; Modise & Nxumalo, 2022), *inequality* (e.g. Szewczyk & Crowder-Meyer, 2022; van Holm, 2018), *corruption* (e.g. Giommoni, 2021; Lacombe *et al.*, 2016), and *education* (e.g. Harka & Rocco, 2022; Lindgren, Oskarsson & Persson, 2019).

We seek to understand how these (instrumental) factors condition voter turnout in Portuguese local elections by applying the fuzzy-set Qualitative Comparative Analysis (fsQCA) method. The fsQCA allows us to determine whether these factors (conditions) are necessary or sufficient causal conditions (individually or in combination) for high or low voter turnout in Portuguese local elections. Based on the results, it will be possible to assess the extent to which instrumental motivations influence voter turnout. For example, if some of these factors are causal conditions for higher turnout, the rational voter paradox will not be supported, as voters will be mobilized despite the low probability that their vote will influence the outcome of the election. The fsQCA thus provides a macro view of individual decisions regarding the choice to vote.

Local elections provide a useful context to study rationality as they are less ideologically driven than national elections (Dodeigne *et al*., 2022). Although many people vote along party lines in local elections, there is evidence "that local candidates do make a difference and contribute strongly to the salience of electoral decisions on the local level." (Marien, Dassonneville & Hooghie, 2015: 898).

In Portugal, local governments have limited power over important policy areas such as the economy or security, which reduces ideological influence. Moreover, Portuguese local elections have a high abstention rate — 47.4% in 2013, 45% in 2017 and 46.4% in 2021 —

underlining the relevance of the rational voter paradox. Nevertheless, the majority go to the polls, which justifies a closer look at the reasons for their voting decision.

The article begins with a literature review on the four factors, later presenting the empirical study and its results, and concludes with a discussion on rationality in voting behavior.

1. Conditions that affect voter-turnout

1.1. Government efficacy

Government efficacy can be seen as a primarily selfish motivation for voting, as people are concerned with personal economic outcomes (Caillier, 2010). Governments with low efficacy provide little well-being to their citizens. However, "the assessment can be based on personal economic outcomes or can be sociotropic (how the economy in general has done for everyone)" (McGann, 2016: 3). In the first case, behavior is driven by a selfish motivation, but in the second case it is driven by a social motivation, i.e., an evaluation of the societal benefits of macro-social outcomes such as economic growth, low inflation, low inequality. However, as mentioned above, the powers of local governments in Portugal are limited in areas of great social or ideological importance, such as economic performance, taxation, price evolution, unemployment or correction of inequalities. Therefore, the analysis of local government efficacy will be essentially based on the scope of local government powers specifically focused on local public goods and local facilities, such as sanitation, water treatment, drinking water supply, maintenance of public squares and gardens, management and maintenance of public roads, construction, housing and other facilities with a local dimension that have a concrete impact on the lives of local citizens. The significance of the link between government efficacy and voter turnout can therefore be seen primarily in the selfish motivation of rational voting decisions, although it cannot be ruled out that there are voters who are primarily socially motivated by the quality of local government for the whole community (Miles, 2015).

If high government efficacy is a causal factor for high turnout, this could indicate that voters want to ensure that incumbents are re-elected (whether for selfish or social motivations) and

shows that instrumental rationality drives turnout and thus rational voter paradox is not supported. The same is true if low government efficacy is a causal factor for high turnout. In this case, voters aim to punish incumbents by voting to prevent their re-election. Again, the rational voter paradox is not supported. If voters do not respond to government efficacy in the form of electoral mobilization, the rational voter paradox remains uncontested. If voter turnout decreases as a result of high or low government efficacy, it becomes even more difficult to understand why the majority of voters participate, further reinforcing the rational voter paradox.

Some studies have found evidence of a positive relationship between government efficacy and voter turnout in local elections. Hansen (1994), for example, found evidence of higher voter turnout in Norwegian local elections in municipalities with more effective government. McDonnell (2020) found that citizens who experience political efficacy participate more in local politics. Modise and Nxumalo (2022), in a study of the fifth local government elections in the North West Province of South Africa in 2016, found that voter turnout fell sharply in municipalities with poor governance, which seems to indicate that voters have lost confidence in the ability of their vote to change the situation.

However, a negative relationship between government efficacy and voter turnout can also be explained by the influence of instrumental rationality on voting decisions. This is the case when low government efficacy mobilizes voters to punish and replace incompetent rulers. According to Wang (2016: 292), "it is distrust rather than trust that stimulates political engagement".

1.2. Inequality

As mentioned above, Portuguese local governments have limited powers in important distributional matters, both in tax and expenditure policy. However, local governments can influence poor and rich citizens differently, as local politicians can respond differently to the interests of different income groups. For example, local governments can allocate public funds to wealthier neighborhoods by investing in infrastructure that improves their quality of

life — such as pedestrian areas, urban beautification, and better accessibility — while increasing property values. Alternatively, they can prioritize social support for lower-income residents by providing free school meals or improving infrastructure and access to disadvantaged neighborhoods. These policy decisions have a significant impact on the distribution of benefits across socio-economic groups. The relationship between inequality and voter turnout in local elections may therefore reflect how different income groups perceive governance in relation to their personal interests, depending on the potential gains or losses they experience. In this context, the influence of inequality on voter turnout can be interpreted through the lens of selfish rationality. For example, if a candidate promises to prioritize the poor in the community if elected, both affluent and low-income voters may be motivated to vote, but for opposite reasons: the latter to achieve policies that benefit them, and the former to prevent the election of a candidate who might undermine their interests. Still, it must be acknowledged that some voters find the persistence of inequality at the local level so repugnant that they feel compelled to vote solely out of social concern for local candidates who promise change. Inequality thus serves as an instrumental motivation — be it selfish or social — for voters to participate in local elections.

A review of the literature on the relationship between inequality and voter turnout reveals the presence of conflicting theories (Stockemer & Scruggs, 2012). While *relative power theory* suggests a negative correlation, *conflict theory* argues for a positive one. According to the first theory, the greater the inequality, the lower the political participation of the poorest (Dash, Ferris and Voia, 2023).

If it turns out that greater inequality leads to lower voter turnout, as this theory predicts, it becomes even more difficult to understand why the majority of voters go to the polls, so the rational voter paradox is not called into question.

In contrast, *conflict theory* assumes that an increase in inequality mobilizes the poor and the rich. According to Stockemer and Scruggs (2012), “This increases the two groups' possible gains and losses in elections by giving citizens more incentives to turn out" (Stockemer & Scruggs 2012: 766).

If it turns out that greater inequality leads to higher voter turnout, as the *conflict theory* predicts, the rational voter paradox is not sustained. If it is unlikely that voter turnout changes with increasing or decreasing income inequality, the rational voter paradox remains undisputed.

The empirical results on the influence of inequality on voter turnout in local elections reflect the opposing views. Schäfer and Schwander (2019) examine local data from 402 counties in Germany between 1998 and 2017 and conclude that there is "a consistently negative effect of income inequality on turnout, with mostly statistically significant coefficients that strengthen confidence in the findings." (Schäfer & Schwander, 2019: 407). In contrast, van Holm (2018) analyzed civic participation at the local level in the United States in a sample of small and medium-sized cities and found that income inequality correlates with higher engagement rates. In the same vein, Szewczyk and Crowder-Meyer (2022) show that local income inequality increases political participation. Kouba, Novák and Strnad (2021) analyzed the determinants of voter turnout in local elections using a sample of 275 elections in 97 countries and found that inequality is not related to local turnout.

To summarize, "the influence of inequality on voter turnout is inconclusive" (Stockemer, 2017: 712).

1.3. Corruption

Several studies point to the negative economic and social consequences of corruption. In the economic dimension, corruption acts as a "major deterrent to growth and development" (Jain, 2001: 71). Corruption has been shown to affect the quality of public services: "whenever public contracts go to the highest bribe payer instead of to the best service provider, then governments and bureaucracies dissipate resources and slow down infrastructure projects" (Stockemer & Calca, 2013: 535). In the social dimension, it is emphasized that corruption jeopardizes the social contract and harms democracy (Drapalova *et al.,* 2019; Kubbe & Engelbert, 2018; Lagunes, 2012). According to Stockemer (2013), corruption is widespread in all types of institutions and affects municipalities, regions, and countries.

Given the macro (economic and social) consequences of corruption described above, its influence on voter turnout could be primarily due to a social motivation (Miles, 2015). However, one could also argue that corruption has a direct personal impact on citizens and causes them to vote for selfish motives. This would be the case with clientelism, where votes are exchanged for personal gain, and with voters who perceive the damage to their personal situation caused by corrupt practices. However, the number of people who benefit from corruption is rather small compared to the electorate. The benefits usually accrue to certain powerful corporations or interest groups that have access to resources and are partners in public contracts (Olson, 1965). Moreover, the personal harm caused by corruption is difficult to be recognized by citizens, as they are ill-informed about a crime that is inherently well hidden and whose victims cannot be easily or directly identified (Friedrichs, 2010). Thus, social ethics and appreciation of the quality of institutions can give corruption a prominent role in influencing voter turnout through social motivation.

Stockemer (2013) points out that corruption can have a *mobilizing effect* on voter turnout. According to Wang (2016), the *mobilizing effect* arises from the lack of trust in institutions caused by corruption. Since elections are an opportunity to punish corrupt rulers, participation is a form of protest. The *mobilizing effect* can also arise from clientelism, as elections enable the election of corrupt politicians who trade votes for public goods. According to Muñoz, Anduiza and Gallego (2016), it also may arise when corrupt politicians govern successfully.

If, regarding to the rational choice model, it turns out that more corruption leads to higher voter turnout, as predicted by the *mobilizing effect*, the rational voter paradox cannot be upheld.

Conversely, corruption can have a *demobilizing effect* and cause citizens to abstain from voting because they do not believe they can influence the behavior of policy makers (Stockemer, LaMontagne & Scruggs, 2011). In this case, corruption socially discourages voters from voting because "people will only vote if they are confident that the political system is responding in some way to their voting behaviour" (Putnam, 2010; cited in Hadjar & Beck,

2010: 527). If citizens do not believe that they can prevent corrupt behavior with their vote, they lose interest in politics and stop going to the polls (Stockemer, LaMontagne & Scruggs, 2011).

If it turns out that higher corruption leads to lower voter turnout, as predicted by the *demobilizing effect*, it becomes even more difficult to understand why the majority of voters go to the polls. The rational voter paradox remains unchallenged. The same is true if turnout is unlikely to change as corruption increases or decreases.

Both the *mobilizing effect* and the *demobilizing effect* find empirical support in empirical studies investigating the relationship between corruption and voter turnout in local elections. Empirical evidence for a positive relationship between corruption and voter turnout (*mobilizing effect*) at the level of local elections can be found in studies by Escalera, Calcagno and Shughart II (2012), Karahan, Coats and Shughart II (2006), Lacombe *et al.* (2016), Neskkova and Kalesnikaite (2019), Stockemer and Calca (2013). Stockemer and Calca (2013) found a positive correlation between corruption and voter turnout in Portuguese local elections. Examples of evidence for the *demobilizing effect* in local elections are the results of Chong *et al.* (2015), Costas-Pérez (2014), Giommoni (2021), Johnson (2024).

There are also studies that find no significant relationship between corruption and voter turnout (e.g., Kostadinova, 2009).

In short, the debate remains open as to whether corruption helps to decrease or increase voter turnout, or whether it has no effect.

1.4. Education

According to the basic rational choice model, voters will be ill-informed because the cost of acquiring and selecting information quickly becomes greater than the expected benefit of voting, given the low probability that each voter's vote will affect the outcome of the election. According to Downs (1957), it is not rational for citizens to be well informed about how to

vote correctly. As Mladenović and VasićIf (2024: 959) point out: "a single vote doesn't add much to the result of the election, why bother to gather information on how to vote?"

Dalton (1988) points out that there is a very large literature in political science dealing with the question of whether voters have the informational and cognitive skills to make democracy work. Cahan and Kaempfer (1992) examined the level of information voters have about the political programs of candidates in various elections and concluded that voters are poorly informed. Elmendorf and Schleicher (2013) refer to the "voter information problem" and emphasize that "Most voters are astonishingly ignorant of basic facts about government and politics" (Elmendorf & Schleicher, 2013: 365). The extensive literature on fiscal illusion also provides evidence of voter misinformation (e.g. Dell'Anno & Mourão, 2012; Parlevliet, Giuliodori & Rooduijn, 2023).

Parlevliet, Giuliodori and Rooduijn (2023), who investigated the problem of fiscal illusion, concluded that "higher literacy and information provision contribute to more prudent fiscal preferences" (Parlevliet, Giuliodori & Rooduijn, 2023: 201). The same can perhaps be said in relation to other issues on the ballot: better informed voters are more likely to vote according to their preferences.

The literature clearly shows that better informed voters are more likely to vote (Lassen, 2005; McMurrey, 2015), which underpins the rationality of the act of voting.

Several studies argue that education develops civic skills, promotes political knowledge and increases political interest (Berinsky & Lenz, 2011; Dee, 2004; Milligan, Moretti & Oreopoulos, 2004). Sondheimer and Green (2010: 186) confirm "that education increases one's general interest in and knowledge of politics" and find "evidence of a causal relationship between education and political interest." These authors also find evidence that "education may set in motion not only changes in outlook but also changes in the way that one is engaged by one's social and political environment" (Sondheimer & Green, 2010: 186). It is therefore expected that a population with a higher level of education will be better informed about political issues and better involved in the community and political endeavors and therefore more likely to

vote. The prediction that education has a positive effect on voter turnout is known as the *absolute education model* (Burden, 2009; Persson, 2013a).

If greater knowledge of politics, governance and democracy, imparted through education, mobilizes voters to the polls, this means that people with a higher level of education have greater social motivation to vote. That is, the rational mobilizing element that expresses the influence of education is social motivation and not so much selfish motivation. However, this may also be the case if a higher level of education enables a better perception of the personal impact of governance.

If, with regard to the rational choice model, it turns out that more education leads to higher voter turnout, as predicted by the *absolute education model*, the rational voter paradox cannot be supported.

There is also no correlation or negative correlation between education and voter turnout in the literature. Weinschenk and Dawes (2022), for example, find no significant positive correlation between civic education and voter turnout. Persson (2013b) finds a negative relationship, which supports the *relative education model*. According to this approach, education is seen as a positional good, i.e., as something that is only valuable to some people on condition that others do not have it. The more people acquire higher education, the lower the social status of a college degree becomes. This leads to a drop in the social status of qualified people. Considering that people with higher social status are more likely to vote because they belong to networks with higher political knowledge and strong social norms (Ahlskog, 2021; Sondheimer & Green, 2010), the loss of social status leads to lower political participation. Thus, if a large proportion of the population has a high level of education, this is no longer a distinguishing feature for voting. According to the *relative education model*, an increase in the proportion of the population with higher education can therefore dampen overall political participation.

If it turns out that a higher level of education leads to lower turnout, as predicted by the *relative education model*, it becomes even more difficult to understand why the majority of

voters go to the polls. The rational voter paradox remains unchallenged. The same is true if turnout does not change with increasing or decreasing levels of education.

There is evidence to support both the *absolute* and *relative* models of education at the level of local elections in different countries. Several studies found a positive relationship supporting the *absolute education model* (Bhatti *et al.*, 2019; Haman & Školník, 2020; Tavares & Raudla, 2018). However, a negative relationship was also found in accordance with the *relative education model* (Harka & Rocco, 2022). There are also several studies that indicate that the relationship is not statistically significant, suggesting that education is not a direct cause of political participation (Lindgren, Oskarsson & Persson, 2019; Freire, Martins & Meirinho, 2012; Tavares, Raudla & Silva, 2020).

In short, with education, as with corruption and inequality, the question remains open as to whether it helps to reduce or increase voter turnout, or whether it has no effect.

2. Hypotheses

With the aim of understanding the rationality of voting in local elections in Portugal, and taking into account the arguments put forward - which have been shown in the literature to be relevant to understanding the level of turnout -, this study analyses the following hypotheses:

a. Hypotheses that call the rational voter paradox into question

a_1 High government efficacy is a causal condition for high voter turnout (vote to reward and re-elect - mainly selfish motivation);

a_2 Low government efficacy is a causal condition for high voter turnout (vote to punish and change – mainly selfish motivation);

a_3 High inequality is a causal condition for high voter turnout (*conflict theory* – mainly selfish motivation);

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a_4 High corruption is a causal condition for high voter turnout (*mobilizing effect* – mainly social motivation);

a_5 High education is a causal condition for high voter turnout (*absolute education model* – mainly social motivation).

b. Hypotheses that sustain the rational voter paradox

b_1 High inequality is a causal condition for low voter turnout (*relative power theory*– mainly selfish demotivation);

b_2 High corruption is a causal condition for low voter turnout (*demobilizing effect* – mainly social demotivation);

b_3 High education is a causal condition for low voter turnout (*relative education model* – mainly social demotivation).

3. Method

The fuzzy-set Qualitative Comparative Analysis (fsQCA) can be used to investigate complex causality (Ragin, 2000). Specifically, in this study it is used to determine whether government efficacy, inequality, corruption, and education, individually or in combination, are necessary and/or sufficient conditions for high or low voter turnout in Portuguese local elections. From the results, conclusions can be drawn about rational behavior in electoral decisions. Voter turnout has been identified as an issue where complex causality is present (Frank & Coma, 2021), but surprisingly, the use of fsQCA to study this issue is very rare, especially in the context of local elections.

3.1. Procedure

The fsQCA, which is based on Boolean algebra, is widely used in the social sciences (Pappas & Woodside, 2021; Roig-Tierno *et al.*, 2017). It identifies necessary and sufficient conditions —

causal pathways — for a particular outcome. In contrast to traditional multivariate statistics, fsQCA considers multiple causality (different combinations leading to the same outcome) and non-symmetry (the causes of high turnout may differ from those of low turnout) (Pappas & Woodside, 2021).

FsQCA uses set membership scores from 0 (non-member) to 1 (full member), where 0.5 is the point of maximum ambiguity. In data calibration, these scores are assigned using percentiles — 95 (full membership), 50 (crossover point) and 5 (full non-membership) — a method commonly used in fsQCA studies (Choi & Cho, 2018).

Causality in fsQCA follows Boolean logic. A condition is necessary if all cases with the outcome are also members of the condition set. It is sufficient if membership in the condition always implies the outcome. Key concepts include consistency (how reliably a condition leads to an outcome) and coverage (the proportion of cases that are explained by a pathway). According to Ragin (2000, 2008) and Fiss (2011), a consistency threshold of 0.9 is required for necessity and 0.75 for sufficiency. A solution should have a consistency of more than 0.75 and ideally a coverage of more than 0.5.

FsQCA offers three types of solutions: complex, intermediate and parsimonious solutions. The parsimonious solution includes only the most important causal conditions that cannot be omitted. The intermediate solution incorporates theoretical assumptions and includes both the parsimonious and complex components. Given the empirical ambiguity in this study, the parsimonious solution is the most appropriate (Pappas & Woodside, 2021)[1].

3.2. 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:

[1] The complex solution is limited as it excludes counterfactual, i.e., combinations of conditions without membership cases defined as 'false', which restricts the results.

~Abstention = *g*(Efficacy of Government; Inequality; Corruption; Education) – (high voter turnout model, i.e., low abstention in elections);

Abstention = *f(*Efficacy of Government; Inequality; Corruption; Education) – (low voter turnout model, i.e., high abstention in elections).

3.3. Research Cases

Portugal has 308 municipalities: 278 on the mainland, 19 in the Azores and 11 in Madeira. On the mainland, there are two levels of government — central and municipal — while the islands have a third, regional level due to their particular characteristics. Nevertheless, municipal powers are consistent across regions.

As Ragin (2000) notes, the fsQCA requires homogeneity of cases. However, there are significant organizational and socio-cultural differences between densely populated urban areas and sparsely populated rural areas. Grouping such different communities together could undermine the validity of the fsQCA and lead to ambiguous results. For example, Vuković (2020) shows that the factors influencing voter turnout vary by municipality size, and Harka and Rocco (2022) find different dynamics in the relationship between education and voter turnout in less populous and less urbanized municipalities. Following this rationale, Portuguese municipalities were divided into four groups based on their size. The size of the municipality was calculated based on the population size of the municipality and the population density, which is an indicator of the degree of urbanization (Tavares *et al.*, 2018). The groups were divided into quartiles based on the statistical distribution of the two indicators.

In the 308 Portuguese municipalities, according to the 2021 Census, the municipalities in the 1st quartile had less than 6250 inhabitants; the median number of inhabitants of the municipalities was 13747 inhabitants and the average number of inhabitants was 33581 inhabitants. In terms of population density, the 1st quartile included municipalities with a population density of up to 25 inhabitants per square kilometer, with the median population density of the municipalities being 66 inhabitants per square kilometer and the average being

292.5 inhabitants per square kilometer. Taking these values into account, the following groups of municipalities were formed:

i) VS (VERY SMALL) – population and population density in the first quartile - 35 municipalities (VS ≤ 6250 inhabitants; VS ≤ 25 inhabitants per km^2);

ii) S (SMALL) - population and population density between the first quartile and the median - 25 municipalities (6250 inhabitants < S ≤13747 inhabitants; 25 inhabitants per km^2< S ≤ 66 inhabitants per km^2);

iii) M (MEDIUM) - population and population density between median and average - 43 municipalities (13747 inhabitants < M ≤33581 inhabitants; 66 inhabitants per km^2< M ≤ 292,5 inhabitants per km^2);

iv) L (LARGE) - - population and population density above the average - 46 municipalities (L > 33581 inhabitants; L > 292,5 inhabitants per km^2).

In total, 149 municipalities were included in the analysis (48,4% of all Portuguese municipalities).[2]

3.4. Measures

ABST - Abstention is measured by the average percentage of abstention in two Portuguese local elections (2013 and 2017)[3].

PRCO – Prevention of corruption is measured by "Dimension E – Rule of Law and Prevention of Corruption" - of the *Local Democracy Quality Index (IQDL)* by Tavares *et al.* (2018). According to the authors, this dimension of the index measures "the Rule of Law and the absence of corruption" (Tavares *et al.*, 2018: 82). Corruption is, therefore, captured in reverse (corruption prevention). The measure includes the average payment period for services,

[2] Corvo and Lajes das Flores, two very small municipalities in the Azores, were excluded as no Gini index data is available for them.

[3] The 2021 election results were not included, as data on corruption prevention and government efficacy were only available up to 2016. Source: Database PORDATA. [Consult. to 29.10.2025]. Available at: https://www.pordata.pt/.

materials, and equipment, the preference for transparent contracting methods, the quality of municipal public contracts and complaints from residents about the municipality and its facilities. This measure captures citizens' perceptions of local government's efforts to prevent corruption and the degree of transparency in procurement. It is therefore consistent with the social motivation of voters in relation to the phenomenon of corruption. However, it is an indirect measure of corruption. But Kauffman, Kraay and Mastruzzi (2007) argue that it is not the actual level of corruption that matters, as the use of direct corruption measures is likely to lead to an underestimation of the extent of corruption. Vuković (2020:129) points out that, "Unless there is a criminal investigation followed by a court hearing, these transactions will remain hidden from the public eye". Stockemer and Calca (2013) used a direct measure of corruption and pointed to the "skewness of the data in favor of none or few corruption cases" (Stockemer & Calca, 2013: 540). The data refer to the period 2013 to 2016.[4]

EDUC – The level of *Education i*s measured by the percentage of the resident population aged 15 or older who have completed secondary education (average of 2011 and 2021 Census values).[5]

INEQ - Inequality is measured by the municipal Gini coefficient for 2017.[6]

EFFI - Efficacy of the government is measured by "Dimension C – Governmental Efficacy" - of the *Local Democracy Quality Index (IQDL)* by Tavares *et al.* (2018). According to the authors, this dimension of the index comprises "Criteria that captures the quality of public services, the absence of political patronage, and the quality and credibility of policies formulated and implemented" (Tavares *et al*., 2018: 39). The data refer to the period 2013 to 2016.[7]

[4] Data were provided by Tavares *et al.* (2018).
[5] Source: Database PORDATA. [Consult. to 29.10.2025]. Available at: https://www.pordata.pt/.
[6] Source: 'Portal do INE: Estatísticas do Rendimento ao nível local - Indicadores de rendimento declarado no IRS: [Consult. to 29.10.2025]. Available at: https://www.ine.pt/xportal/xmain?xpid=INEandxpgid=ine_destaquesandDESTAQUESdest_boui=382407872andDESTAQUESmodo=2andxlang=pt.
[7] Data were provided by Tavares *et al.* (2018).

3.5. Calibration thresholds

As mentioned earlier, data were calibrated in the range between zero and one, using as thresholds the percentiles 95 (full membership), 50 (central point), and 5 (full non-membership). The fsQCA calibration thresholds, the data of the sets and calibrated data are in the Appendix.[8]

4. Results

4.1. Necessary conditions

Table 1 - Necessary conditions for membership in high/low voter turnout.

SETS	Outcome: HIGH VOTER TURNOUT – Consistency				Outcome: LOW VOTER TURNOUT - Consistency			
	VS	S	M	L	VS	S	M	L
High PRCO	0.61	0.57	0.69	0.68	0.73	0.59	0.72	0.67
Low PRCO	0.72	0.68	0.59	0.63	0.60	0.66	0.58	0.63
High EDUC	0.71	0.67	0.485	0.46	0.57	0.45	0.69	0.83
Low EDUC	0.57	0.55	0.77	0.85	0.71	0.76	0.59	0.46
High INEQ	0.50	0.47	0.60	0.53	0.71	0.75	0.61	0.69
Low INEQ	0.76	0.76	0.67	0.75	0.56	0.48	0.69	0.58
High EFFI	0.59	0.68	0.59	0.61	0.653	0.69	0.69	0.69
Low EFFI	0.67	0.60	0.68	0.64	0.62	0.57	0.61	0.55

Notes: Values rounded to two decimal places.

Source: The author.

As can be seen in Table 1, the consistency of all conditions in the four groups of municipalities is below 0.9, which means that none of these conditions or their combinations are a necessary condition for high or low voter turnout.

4.2. Sufficient conditions

Table 2 presents the sufficient conditions of the parsimonious solution for high voter turnout in the four groups of municipalities.

[8] The data were computed using the fsQCA 3.0 software package developed by Charles Ragin and Sean Davey, which uses the Quine-McCluskey algorithm. [Consult. to 29.10.2025]. Available at: http://www.socsci.uci.edu/~cragin/fsQCA/software.shtml.

Table 2 - Sufficient conditions for high voter turnout (low abstention).

Gr.	Sufficient conditions (pathways)	Consist.	Nr. of mun.	Freq. cut-off	Consist-cut-off	Solution consist.	Solution cover.
VS	~INEQ ^EDUC^ ~EFFI	0.909706	5	-------	-------	-------	-------
	~INEQ ^ EDUC ^ ~PRCO	0.906358	4	2	0.915556	0.902256	0.540541
S	~INEQ ^ EDUC	0.835869	8	-------	-------	-------	-------
	~INEQ ^ ~EFFI	0.856474	4	-------	-------	-------	-------
	~INEQ^~PRCO	0.806162	4	1	0.828423	0.78508	0.718699
M	~EDUC ^ ~EFFI	0.836218	8	-------	-------	-------	-------
	~INEQ ^ EFFI ^ ~PRCO	0.879245	2	1	0.847568	0.831549	0.656292
L	~EDUC ^ ~EFFI	0.888039	9	-------	-------	-------	-------
	~EDUC^~INEQ	0.916201	12				
	~EDUC^~PRCO	0.89410	8	1	0.86002	0.878365	0.820018

Notes: The prefix '^' denotes "and"; '~' means the "negation of a condition".
Source. The author.

Table 2 shows that high voter turnout is the result of several combinations of conditions in all groups of municipalities, suggesting multiple causality. In general, low government efficacy, low inequality and low corruption prevention are associated with higher voter turnout.

In very small municipalities, two combinations are sufficient: (i) low inequality *and* high education *and* low government efficacy, and (ii) low inequality *and* high education *and* low corruption prevention.

Small municipalities show similar patterns with three combinations: (i) low inequality *and* high education, (ii) low inequality *and* low government efficacy, and (iii) low inequality *and* low corruption prevention.

In medium-sized municipalities, the patterns remain similar, although the role of education changes and government efficacy shows mixed effects.

In large municipalities, three pathways lead to high voter turnout, with government efficacy behaving as in smaller groups. The role of education is similar to that in medium-sized

municipalities. Thus, it appears that education mobilizes voters only in smaller municipalities. The fact that the influence of education varies by municipality size suggests that contextual factors may influence voter turnout.

Table 3 shows the sufficient conditions for low voter turnout in the four groups of municipalities.

Table 3 - Sufficient conditions for low voter turnout (high abstention).

Gr.	Sufficient conditions (pathways)	Consist.	Nr. of mun.	Freq. cut-off	Consist. cut-off	Solution consist.	Solution cover.
VS	INEQ ^ ~EDUC	0.827712	6	-------	-------	-------	-------
	INEQ ^ PRCO	0.872266	7	2	0.885756	0.812261	0.614849
S	INEQ ^ PRCO	0.884498	2	-------	-------	-------	-------
	INEQ ^ EFFI	0.858855	4	1	0.850498	0.84289	0.57874
M	~INEQ ^ EDUC	0.824365	8	------	-------	-------	-------
	PRCO^EDUC	0.839399	6				
	~ PRCO^INEQ^EFFI	0.832962	4	1	0.84957	0.781664	0.719161
L	EDUC	0.850195	17	------	-------	-------	-------
	INEQ ^ PRCO	0.902422	8	1	0.907035	0.841387	0.910202

Notes: The prefix '^' denotes "and"; '~' means the "negation of a condition".
Source: The author.

Table 3 shows that high inequality lowers voter turnout and supports earlier findings (Table 2) on the differential effects of education by municipality size. In very small municipalities, low turnout is associated with (i) high inequality *and* low education, and (ii) high inequality *and* high corruption prevention.

In the small municipalities this sufficient condition still applies, and in the former, high government efficacy appears in place of low education.

In the medium-sized municipalities, the biggest difference from the small municipalities is that a high level of education is associated with a low voter turnout. Finally, in the large municipalities, this relationship persists and the results for inequality and corruption prevention are in line with those of the other municipality groups.

An overview of the differences between municipality groups in Tables 3 and 4 suggests that the interaction between voters and governments does not differ significantly by municipality dimension, except for education. There is little asymmetry in voter turnout (high vs. low).

5. Discussion

The main aim of this study was to analyze whether rationality, driven by selfish and social motivations, helps to explain the level of turnout in Portuguese local elections. The study is based on existing evidence on the influence of four factors on electoral voting levels in local elections: government efficacy, inequality, corruption prevention, and education. The literature reveals that the influence of these factors can be explained by opposing theories regarding their effects on voter turnout. Furthermore, the influence of these factors on voter turnout levels may express the result of rational choices regarding the act of going to vote, based on selfish or social motivations, with government efficacy and inequality more linked to selfish motivations, and corruption and education more based on social motivation.

Fuzzy-set Qualitative Comparative Analysis (fsQCA) was used to test several hypotheses to assess the role of each factor and its rational motivation. The findings help determine whether rational choice theory explains voter turnout and challenges the rational voter paradox. The fsQCA is well suited for this analysis because it handles asymmetry, allows for multiple causal pathways, and provides simplified solutions without strict assumptions - which is consistent with the conflicting theoretical perspectives of the study.

Taking into account the results of previous studies showing differences in causality patterns depending on the population size and the degree of urbanization of the municipalities (e.g. Vuković, 2020), Portuguese municipalities were classified into four groups based on these dimensions: very small, small, medium and large.

The results show that no single factor, either alone or in combination, is necessary for high or low voter turnout in Portuguese municipalities. However, several combinations of factors

(multicausality) are sufficient and enable an answer to the previously formulated hypotheses through complex interactions.

The results regarding *government efficacy* indicate a certain mobilizing effect when governance is poor. This confirms hypothesis a_2, but not a_1. In fact, low government efficacy is part of the sufficient conditions for high voter turnout. Only for medium-sized municipalities is there some ambiguity. These results confirm the view of Wang (2016: 292), who states that "it is distrust rather than trust to stimulate political engagement". This means that voters see elections as an opportunity to change the situation. This shows that voters vote rationally and believe that their vote is important, which calls into question the rational voter paradox based on a selfish motivation in response to low government efficacy.

Inequality shows a stable relationship in the study and proves to be an important factor for the lack of voter turnout. In fact, inequality is the most common factor across all municipality groups—except for medium-sized ones, where results are inconclusive. Overall, the results support *relative power theory*, which posits that poorer voters lose interest in local politics as a way to give voice to their aspirations because they believe that policymakers are essentially responsive to the interests of high-income groups (Dash, Ferris & Voia, 2023). Accordingly, hypothesis b_1 is confirmed and a_3 is not confirmed. The inequality results support the rational voter paradox as they do not indicate mobilization in response to inequality.

Corruption prevention, in conjunction with other factors, helps to explain voter turnout in all community groups. Low corruption prevention appears in at least one pathway for high voter turnout in each group, suggesting that perceived corruption risks mobilizing voters. This supports hypothesis a_4, disproves b_2, and is consistent with the findings of Stockemer and Calca (2013). These results challenge the rational voter paradox by showing that voters act when corruption is high. One may wonder whether clientelism is at play here, as Lacombe *et al.* (2016) suggest. Are voters mobilized to secure benefits from corrupt governments or to punish them? A comparison of the 2013 and 2017 local elections in municipalities that meet the pathways for high voter turnout, including the condition of low corruption prevention, can help to understand the reasons for the *mobilizing effect*. Of the 18 municipalities that

fulfill a sufficient condition for high turnout (Table 2), 7 changed ruling parties[9], 5 recorded a significant decrease in the incumbent's vote share[10], and only 6 recorded gains[11]. This indicates that voters overwhelmingly reject incumbents in contexts with weak corruption prevention. Therefore, as also indicated by Neskkova and Kalesnikaite (2019: 689), it appears that "This finding suggests that at least at the local level, where ties between the community and public officials are presumably stronger, the public has not given up on corruption".

Education has mixed effects depending on the size of the municipality. In very small and small municipalities, higher education is associated with higher voter turnout, which supports the *absolute education model* and confirms hypothesis a_5 (not b_3). In medium and large municipalities, the opposite is true — high education is associated with lower voter turnout, which supports the *relative education model* and confirms hypothesis b_3 (not a_5). This suggests that education in larger municipalities reflects social status rather than civic engagement and leads to demobilization when it no longer distinguishes voters from others. Education as such does not challenge the paradox of the rational voter in these areas. Harka and Rocco (2022) also found a negative relationship between education and voter turnout, but their findings focused on poorer areas with low social capital, which does not apply to the large Portuguese municipalities in this study.

From a political science perspective, the overall findings support the rational voter model and suggest that both self-interest and social motivations influence voter turnout - in line with Edlin, Gelman and Kaplan (2007), who question the rational voter paradox.

From a policy perspective, the findings emphasize the importance of reducing inequality, improving corruption prevention, and ensuring government efficacy to increase voter turnout at the local level.

[9] (VS) Alter do Chão, Alandroal, (S) Celorico da Beira, (L) Esposende, Paredes, Vila do Conde, and Felgueiras.
[10] (VS) Góis, (S) Vila Viçosa, Tábua, (M) Póvoa do Lanhoso, and (L) Barcelos.
[11] (VS) Avis, (S) Madalena, (M) Tondela, (L) Paços de Ferreira, Penafiel, and Guimarães.

Conclusion

Despite the high abstention rate in Portuguese local elections, this study provides evidence that voters behave rationally, challenging the rational voter paradox. Voter turnout is shaped by multiple causal configurations, with corruption acting as a mobilizing factor and inequality contributing to disengagement. Notably, high levels of education do not lead to high voter turnout in densely populated, urban municipalities. In addition, citizens tend to respond to poor governance by participating in elections.

These findings suggest that the local political system in Portugal is functioning as a mechanism for the collective expression of citizen preferences, with electoral participation serving as a response to governance failures and corruption.

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 all municipalities that were not included should be done with caution, as it is a qualitative, i.e., case-based, analysis.

Disclosure of interest.

The author reports there are no competing interests to declare.

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Apendix

Table 4 - Sets and fsQCA calibration thresholds.

Groups	SETS	Full membership – percentile 95	Central point- percentile 50	Full non-membership – percentile 5
VS	ABS	40.035	28.550	23.720
	PRCO	82.07691549	24.41542017	-76.73409583
	EDUC	22.21	18.3	14.7
	INEQ	26.73	22.6	20.07
	EFFI	73.634	38.187	-21.044
S	ABS	45.280	36.450	32.340
	PRCO	58.50015394	30.94465769	-57.18871837
	EDUC	23.84	18.9	16.42
	INEQ	26.7	23.8	21.2
	EFFI	61.215	10.940	-55.697
M	ABS	51.500	44.300	34.030
	PRCO	52.54073884	16.72762053	-90.93800753
	EDUC	26.61	22.4	19.03
	INEQ	27.94	24.1	21.92
	EFFI	66.317	11.042	-63.941
G	ABS	59.050	48.475	30.500
	PRCO	63.9983338	22.59762796	-133.8724337
	EDUC	29.275	23.85	20.5
	INEQ	29.375	24.7	21.825
	EFFI	63.067	5.093	-82.616

Source: The author.

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Table 5 - Data set Very Small Municipalities (VS).

Municipalities	ABST	PRCO	INEQ	EDUC	EFFI
Alandroal	24.35	-70.3307	19.3	18.8	18.3508
Alfândega da Fé	30.95	37.8622	27.5	18.3	-26.7637
Aljezur	39.6	-60.9701	25.4	24.8	-6.48657
Almeida	35.5	53.7759	23.5	16.7	25.3373
Alter do Chão	27.75	-14.8538	21.6	19.1	64.976
Arronches	20.25	80.1987	21.6	20	19.4713
Avis	27.7	15.0884	21	20.7	39.3358
Boticas	46.55	39.3824	25.9	14.4	75.7424
Carrazeda de Ansiães	37.3	104.947	26.8	16.3	44.9522
Castelo de Vide	26.5	27.5502	22.9	20.5	52.6712
Crato	23.75	19.3015	20.4	17	56.4232
Fig. de Castelo Rodrigo	26.15	-43.4625	25.6	15.3	64.9467
Freixo de Espada à Cinta	24.35	3.07368	22.7	16.9	-61.8738
Fronteira	23.65	-2.56686	24.7	20.5	-2.51968
Gavião	30.75	-25.9098	21.1	16.7	72.7306
Góis	27.05	11.5597	21.7	19.6	-10.0453
Marvão	24.9	24.7342	20.9	16.9	33.8931
Mêda	33.5	57.6213	24.9	14.7	-18.5926
Mértola	26.95	46.519	22	19	63.7996
Monchique	28.55	10.2771	22.9	20.4	28.3251
Mora	39.1	86.4595	21.2	17	20.4376
Nisa	30.9	54.4464	22.6	17.9	48.0012
Oleiros	28.1	24.4154	22.9	15.5	49.2299
Ourique	24.6	-91.6753	23.6	20.8	11.8279
Pampilhosa da Serra	33.55	-23.9729	20.1	14.7	43.1626
Penamacor	28.95	-146.016	21.6	17.4	38.1875
Portel	29.1	36.7344	21	22	66.2445
São Roque do Pico	31.15	6.03192	26.2	21.7	147.313
Sousel	26.3	37.2114	21.8	19.6	-2.89213
Viana do Alentejo	35.1	20.8353	22.3	22.7	46.8322
Vidigueira	33.45	-47.5421	22.8	21	16.9732
Vila de Rei	27.1	32.5105	20.1	18.7	25.4175
Vila Flor	35.9	55.7364	26.7	17.6	38.8793
Vila Velha de Ródão	27.55	54.4802	20	17.7	13.7028
Vimioso	41.05	53.445	25.5	14.9	39.7973

Source: The author.

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Table 6 - Data set Very Small Municipalities (VS) calibrated Data (c).

Municipalities	**cABST**	**cPRCO**	**cINEQ**	**cEDUC**	**cEFFI**
Alandroal	0.07	0.06	0.02	0.59	0.27
Alfândega da Fé	0.65	0.67	0.97	0.5	0.04
Aljezur	0.95	0.07	0.88	0.99	0.09
Almeida	0.86	0.82	0.66	0.21	0.34
Alter do Chão	0.38	0.24	0.23	0.65	0.91
Arronches	0.01	0.95	0.23	0.79	0.28
Avis	0.37	0.43	0.13	0.86	0.52
Boticas	0.99	0.69	0.92	0.04	0.96
Carrazeda de Ansiães	0.91	0.99	0.95	0.16	0.64
Castelo de Vide	0.22	0.54	0.55	0.84	0.77
Crato	0.05	0.46	0.07	0.25	0.82
Fig. de Castelo Rodrigo	0.18	0.12	0.9	0.08	0.91
Freixo de Espada à Cinta	0.07	0.35	0.52	0.24	0.01
Fronteira	0.05	0.31	0.82	0.84	0.11
Gavião	0.64	0.18	0.14	0.21	0.95
Góis	0.28	0.41	0.26	0.73	0.08
Marvão	0.09	0.5	0.12	0.24	0.45
Mêda	0.78	0.85	0.84	0.05	0.05
Mértola	0.27	0.76	0.33	0.63	0.9
Monchique	0.5	0.4	0.55	0.83	0.38
Mora	0.94	0.96	0.16	0.25	0.29
Nisa	0.65	0.83	0.5	0.42	0.7
Oleiros	0.43	0.5	0.55	0.09	0.72
Ourique	0.08	0.03	0.67	0.87	0.21
Pampilhosa da Serra	0.79	0.19	0.05	0.05	0.6
Penamacor	0.53	0.01	0.23	0.32	0.5
Portel	0.54	0.65	0.13	0.94	0.91
São Roque do Pico	0.66	0.37	0.93	0.93	1
Sousel	0.2	0.66	0.28	0.73	0.11
Viana do Alentejo	0.85	0.47	0.41	0.97	0.68
Vidigueira	0.78	0.11	0.54	0.89	0.25
Vila de Rei	0.29	0.6	0.05	0.58	0.34
Vila Flor	0.87	0.84	0.95	0.36	0.51
Vila Velha de Ródão	0.35	0.83	0.04	0.38	0.22
Vimioso	0.96	0.82	0.89	0.06	0.53

Source: The author.

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Table 7 - Data set Small Municipalities (S).

Municipalities	ABST	PRCO	INEQ	EDUC	EFFI
Alijó	35.9	31.3526	25.4	17.2	-92.1236
Arganil	35.35	61.3102	21.9	20.8	5.23791
Campo Maior	32.25	55.7043	21.1	25	45.504
Castro Daire	38.95	24.6852	25.1	16.5	53.4426
Celorico da Beira	34.95	-59.362	23.4	17.6	-53.8632
Ferreira do Zêzere	32.1	32.49	21.6	20.1	9.79847
Gouveia	41.75	21.1988	24.5	17	5.75479
Madalena	33.4	-1.33443	23.2	21.7	50.5134
Melgaço	55.35	-48.4955	24.8	16.6	16.2798
Moimenta da Beira	44.4	13.0841	26.7	18.9	-17.9879
Mondim de Basto	42.25	-7.68153	25.4	18.2	-56.1549
Mortágua	40.2	31.5585	23.8	16.7	23.5465
Oliveira de Frades	35.55	59.1991	22.3	21.8	28.8497
Paredes de Coura	36.45	-13.3365	23.1	19.4	9.74445
Penacova	41.35	34.3292	21.9	18.3	79.8556
Penalva do Castelo	36.5	-0.71633	24.7	15.6	23.5582
Ponte da Barca	39.65	31.1133	25.7	21.3	-9.2987
São João da Pesqueira	34.8	-139.228	27.3	16.5	9.87049
Sátão	45.5	39.0295	25.2	19	37.7074
Tábua	35.1	3.68129	21.6	20.2	-19.9276
Vendas Novas	41.45	37.6928	22	23.6	27.2109
Vieira do Minho	33.25	30.9447	25.6	18.3	-7.61688
Vila Pouca de Aguiar	43.65	45.7747	26.7	16.4	39.646
Vila Viçosa	32.7	-21.8026	20.8	23.9	63.158
Vouzela	33.35	32.4845	22.3	19.2	10.9399

Source: The author.

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Table 8 - Data set Small Municipalities (S) calibrated Data (c).

Municipalities	**cABST**	**cPRCO**	**cINEQ**	**cEDUC**	**cEFFI**
Alijó	0.4	0.51	0.84	0.11	0.01
Arganil	0.31	0.96	0.1	0.76	0.44
Campo Maior	0.04	0.94	0.04	0.98	0.89
Castro Daire	0.7	0.45	0.79	0.05	0.93
Celorico da Beira	0.25	0.04	0.39	0.17	0.05
Ferreira do Zêzere	0.04	0.54	0.07	0.67	0.49
Gouveia	0.86	0.42	0.67	0.09	0.44
Madalena	0.1	0.25	0.33	0.85	0.91
Melgaço	1	0.06	0.74	0.06	0.58
Moimenta da Beira	0.94	0.35	0.95	0.5	0.21
Mondim de Basto	0.88	0.21	0.84	0.3	0.05
Mortágua	0.78	0.52	0.5	0.07	0.68
Oliveira de Frades	0.34	0.96	0.15	0.85	0.74
Paredes de Coura	0.5	0.18	0.31	0.58	0.49
Penacova	0.84	0.59	0.1	0.33	0.98
Penalva do Castelo	0.5	0.25	0.72	0.02	0.68
Ponte da Barca	0.75	0.5	0.88	0.81	0.29
São João da Pesqueira	0.23	0	0.97	0.05	0.49
Sátão	0.96	0.71	0.81	0.52	0.83
Tábua	0.27	0.28	0.07	0.69	0.2
Vendas Novas	0.85	0.68	0.11	0.95	0.73
Vieira do Minho	0.09	0.5	0.87	0.33	0.3
Vila Pouca de Aguiar	0.92	0.83	0.95	0.05	0.85
Vila Viçosa	0.06	0.14	0.03	0.95	0.96
Vouzela	0.09	0.54	0.15	0.55	0.5

Source: The author.

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Table 9 - Data set Medium Municipalities (M).

Municipalities	ABST	PRCO	INEQ	EDUC	EFFI
Albergaria-a-Velha	40.65	35.9274	22.3	22.9	11.1047
Alcochete	45.7	-224.002	28.2	28	31.5364
Almeirim	51.6	10.3553	24.2	22.7	32.3879
Amares	37.65	-17.218	24.7	23.6	-26.5419
Anadia	45.3	29.6987	24.4	20.5	21.0586
Arruda dos Vinhos	39.6	4.67437	25.5	24.8	29.6144
Azambuja	45.95	7.29209	22.6	25.4	-7.72145
Baião	35.2	36.2659	24.1	18.7	3.80506
Batalha	44.6	45.1278	21.9	22.8	54.8378
Caminha	35.7	8.62423	27.4	23	-10.3748
Cantanhede	48.4	56.2947	25.2	20.1	37.9819
Cartaxo	47	-56.7284	23.2	25.1	-115.821
Castelo de Paiva	25.3	-5.26753	22.4	19.8	-51.2293
Celorico de Basto	36.1	56.7761	24.1	19.3	-8.5665
Cinfães	33.9	52.6426	25.8	18.2	5.45495
Condeixa-a-Nova	44.3	11.8558	23.5	23.3	33.3342
Estarreja	49.5	50.1031	23.5	22	18.8512
Horta	37.95	30.9859	26.4	22.6	65.066
Lagoa	50.6	7.42827	26.6	25.8	50.9752
Lagos	53.45	39.6303	25.8	26.8	-8.3923
Lamego	37.1	-15.4782	28.3	20.5	-25.3383
Lourinhã	45.95	-6.05329	25.6	22.9	-34.3087
Lousã	46.45	34.5493	22.9	25.6	41.9567
Machico	43.9	-93.3498	24.1	19.8	-65.3091
Mangualde	42.95	22.1696	23.7	19.7	25.01
Mealhada	49.05	51.6239	23.1	22.7	72.8223
Monção	40.35	44.6723	24.8	20.5	-16.3005
Montemor-o-Velho	38.6	-69.2316	22.1	22.4	-51.6262
Nazaré	50.1	-193.654	23.4	22.6	-119.439
Oliveira do Bairro	46.8	33.782	23.1	23.1	14.7778
Oliveira do Hospital	33.8	33.9947	21.6	20.3	69.5147
Peso da Régua	40.2	1.73714	26.5	21.2	-27.8435
Porto de Mós	41	30.4323	21.5	22	11.0419
Póvoa de Lanhoso	35.65	13.8745	23.7	19.9	66.456
Ribeira Grande	45.65	16.7276	28	19	53.9852
Rio Maior	41.9	-23.9338	23	24.3	-0.07635
Salvaterra de Magos	51.95	47.6015	23.2	22.4	20.7744
Sines	45.5	-0.35542	25.2	26.7	-21.4037
Tondela	41.25	-52.1709	23.6	19.7	26.2045
Torres Novas	46.4	22.8285	23.6	23.6	-9.78581
Vagos	46.6	27.2833	24.1	21.4	-17.441
Vale de Cambra	36.05	28.4643	22.8	19.3	-29.9723
Vila Praia da Vitória	50.4	-7.16031	24.8	20.4	32.1878

Source: The author.

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Table 10 - Data set Medium Municipalities (M) calibrated Data (c).

Municipalities	cABST	cPRCO	cINEQ	cEDUC	cEFFI
Albergaria-a-Velha	0.26	0.83	0.08	0.59	0.5
Alcochete	0.64	0	0.96	0.98	0.75
Almeirim	0.95	0.46	0.52	0.55	0.76
Amares	0.13	0.28	0.62	0.7	0.18
Anadia	0.6	0.75	0.56	0.16	0.63
Arruda dos Vinhos	0.2	0.42	0.75	0.85	0.73
Azambuja	0.67	0.43	0.11	0.89	0.32
Baião	0.07	0.84	0.5	0.04	0.43
Batalha	0.53	0.92	0.05	0.57	0.92
Caminha	0.08	0.44	0.93	0.61	0.3
Cantanhede	0.85	0.96	0.7	0.11	0.81
Cartaxo	0.75	0.11	0.22	0.87	0.01
Castelo de Paiva	0	0.35	0.09	0.09	0.08
Celorico de Basto	0.08	0.97	0.5	0.06	0.31
Cinfães	0.05	0.95	0.79	0.02	0.44
Condeixa-a-Nova	0.5	0.47	0.3	0.66	0.77
Estarreja	0.9	0.94	0.3	0.41	0.6
Horta	0.14	0.77	0.86	0.54	0.95
Lagoa	0.93	0.44	0.88	0.92	0.9
Lagos	0.98	0.87	0.79	0.96	0.31
Lamego	0.11	0.29	0.96	0.16	0.19
Lourinhã	0.67	0.35	0.76	0.59	0.14
Lousã	0.71	0.82	0.16	0.91	0.84
Machico	0.47	0.04	0.5	0.09	0.05
Mangualde	0.4	0.61	0.37	0.08	0.68
Mealhada	0.88	0.95	0.2	0.55	0.97
Monção	0.24	0.91	0.63	0.16	0.25
Montemor-o-Velho	0.16	0.08	0.06	0.5	0.08
Nazaré	0.92	0	0.28	0.54	0.01
Oliveira do Bairro	0.74	0.81	0.2	0.62	0.55
Oliveira do Hospital	0.04	0.81	0.03	0.13	0.96
Peso da Régua	0.23	0.4	0.87	0.26	0.17
Porto de Mós	0.28	0.76	0.03	0.41	0.5
Póvoa de Lanhoso	0.07	0.48	0.37	0.1	0.95
Ribeira Grande	0.64	0.5	0.95	0.05	0.91
Rio Maior	0.33	0.24	0.18	0.79	0.39
Salvaterra de Magos	0.96	0.93	0.22	0.5	0.63
Sines	0.62	0.38	0.7	0.96	0.21
Tondela	0.29	0.13	0.33	0.08	0.69
Torres Novas	0.71	0.63	0.33	0.7	0.3
Vagos	0.72	0.71	0.5	0.29	0.24
Vale de Cambra	0.08	0.73	0.14	0.06	0.16
Vila Praia da Vitória	0.93	0.34	0.63	0.14	0.76

Source: The author.

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Table 11 - Data set Large Municipalities (L).

Municipalities	ABST	PRCO	INEQ	EDUC	EFFI
Albufeira	59.85	47.6629	25.4	29.4	31.3592
Almada	57.65	41.0274	26.2	26.9	-5.07608
Amadora	58.25	16.4901	24.9	27.1	68.3174
Aveiro	50.95	-125.722	25.9	23.7	-56.8748
Barcelos	29.6	21.5396	22	21.5	-4.1189
Barreiro	52.3	23.6557	23	27.7	64.2064
Braga	41.25	-54.2817	26.5	24.1	18.304
Cascais	59.25	-15.8865	29.9	27	61.9956
Coimbra	48.55	26.947	27.7	22.1	20.5318
Esposende	40.75	-52.981	26.3	22.1	63.4243
Faro	54.5	-1.06569	26.4	26.4	-37.9559
Felgueiras	34.15	13.2956	20.9	20.5	26.2302
Funchal	48.4	-8.22704	27.4	23.4	-19.7931
Gondomar	46.7	25.2707	24.4	25.1	-70.4803
Guimarães	36.4	11.3459	22.3	21.2	-42.0787
Ílhavo	58.1	49.5205	25.2	23.3	21.4983
Lisboa	51.85	30.7285	32.2	21.1	-20.7242
Loures	49.1	51.3194	24.2	26.4	54.3222
Lousada	29.8	66.6559	21.8	20.5	-12.4038
Mafra	48.95	48.1008	26.6	26.8	45.9201
Maia	46.45	35.025	26.1	25	-32.2662
Matosinhos	49	-38.8737	26.9	23.3	16.4102
Moita	58.45	-1.72743	21.8	28.1	58.0212
Odivelas	55.2	-4.75081	24.1	26.8	31.6021
Oeiras	48.75	29.642	27.8	25.2	49.9948
Olhão	57.25	-15.4333	24.5	25.7	-26.1971
Oliveira de Azeméis	42.3	34.2814	22.4	21.1	-17.6821
Ovar	46.65	73.8293	24.2	23.8	38.728
Paços de Ferreira	33.45	-113.978	21.9	19.6	-34.2731
Paredes	32.6	-136.589	24.9	22.2	17.168
Penafiel	28.45	-57.6861	23.9	22.2	-14.2311
Portimão	58.2	-164.384	25.1	27.1	-68.7212
Porto	46.85	34.9912	31	20.9	31.5175
Póvoa de Varzim	50.5	24.6372	26.8	22.6	53.6686
Santa Cruz (Madeira)	42.95	-31.4147	24.4	27	-86.6608
Santa Maria da Feira	43.65	85.133	23.7	21.7	-33.3385
Santo Tirso	35.85	56.0255	22.4	20.2	-20.5128
Seixal	58.9	-17.128	23.6	28.9	-0.46322
Setúbal	59.1	-151.478	25.3	27.2	-21.9718
Sintra	58.65	31.9827	24.4	30.8	2.87582
Trofa	33.95	47.4235	22.4	22.7	-95.2472
Valongo	47.7	50.5914	23.9	25	7.30965
Vila do Conde	40.6	5.96167	25.5	22.1	25.4314
Vila Franca de Xira	53.7	44.2473	22.4	29.8	35.2285
Vil. Nova de Famalicão	35.75	27.7643	22.3	23	45.6234
Vila Nova de Gaia	47.25	12.8449	26.3	23.9	-86.6977

Source: The author.

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Table 12 - Data set Large Municipalities (L) calibrated Data (c).

Municipalities	cABST	cPRCO	cINEQ	cEDUC	cEFFI
Albufeira	0.96	0.86	0.61	0.96	0.8
Almada	0.93	0.79	0.72	0.84	0.41
Amadora	0.94	0.47	0.53	0.86	0.96
Aveiro	0.67	0.06	0.68	0.47	0.11
Barcelos	0.04	0.49	0.06	0.11	0.42
Barreiro	0.75	0.52	0.15	0.89	0.96
Braga	0.23	0.19	0.76	0.53	0.66
Cascais	0.96	0.32	0.97	0.85	0.95
Coimbra	0.51	0.58	0.87	0.17	0.69
Esposende	0.22	0.19	0.74	0.17	0.95
Faro	0.85	0.39	0.75	0.8	0.19
Felgueiras	0.08	0.46	0.02	0.05	0.75
Funchal	0.5	0.36	0.85	0.4	0.3
Gondomar	0.43	0.55	0.42	0.67	0.07
Guimarães	0.12	0.45	0.08	0.09	0.17
Ílhavo	0.94	0.88	0.58	0.38	0.7
Lisboa	0.72	0.64	0.99	0.08	0.29
Loures	0.54	0.89	0.37	0.8	0.93
Lousada	0.04	0.96	0.05	0.05	0.35
Mafra	0.53	0.86	0.77	0.84	0.89
Maia	0.42	0.71	0.71	0.65	0.22
Matosinhos	0.54	0.24	0.8	0.38	0.64
Moita	0.94	0.39	0.05	0.91	0.94
Odivelas	0.87	0.37	0.35	0.84	0.8
Oeiras	0.52	0.62	0.88	0.68	0.91
Olhão	0.92	0.33	0.45	0.74	0.26
Oliveira de Azeméis	0.26	0.7	0.08	0.08	0.31
Ovar	0.42	0.98	0.37	0.49	0.85
Paços de Ferreira	0.08	0.07	0.05	0.02	0.21
Paredes	0.07	0.05	0.53	0.19	0.65
Penafiel	0.03	0.18	0.3	0.19	0.34
Portimão	0.94	0.03	0.56	0.86	0.07
Porto	0.43	0.71	0.98	0.07	0.8
Póvoa de Varzim	0.64	0.54	0.79	0.25	0.93
Santa Cruz (Madeira)	0.28	0.26	0.42	0.85	0.04
Santa Maria da Feira	0.31	0.99	0.26	0.13	0.21
Santo Tirso	0.11	0.92	0.08	0.04	0.29
Seixal	0.95	0.32	0.24	0.94	0.45
Setúbal	0.95	0.03	0.6	0.86	0.28
Sintra	0.95	0.66	0.42	0.98	0.48
Trofa	0.08	0.86	0.08	0.26	0.03
Valongo	0.47	0.88	0.3	0.65	0.53
Vila do Conde	0.21	0.42	0.63	0.17	0.74
Vila Franca de Xira	0.81	0.83	0.08	0.96	0.83
Vil. Nova de Famalicão	0.11	0.59	0.08	0.32	0.89
Vila Nova de Gaia	0.45	0.45	0.74	0.51	0.04

Source: The author.

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