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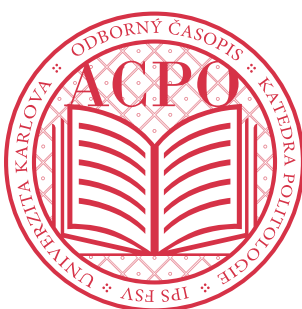
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## Invalid votes under compulsory voting: Poverty and runoff voting in Peruvian municipalities<sup>1</sup>

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### Abstract:

*The objective of this article is to analyze invalid votes under compulsory voting in Peru. I analyzed three Peruvian presidential elections (held in 2006, 2011, and 2016). I investigated the results of these elections at the municipal level, examining the first and second rounds separately. Thus, I created an original dataset that includes 5,478 cases from each round. I used the ordinary least squares (OLS) regression models to test theories related to invalid votes. First, I found that the higher the level of development in municipalities, the lower the number of invalid votes in municipalities. Second, I examined a feature of runoff voting and found that the higher the share of votes for eliminated candidates in the first round, the greater the number of invalid votes in the second round. These results suggest that invalid voting is linked to socioeconomic grievances and that electoral abstention under non-compulsory voting transforms into invalid votes in the second round under compulsory voting when voters' choices are limited. These findings contribute to the current research on invalid voting, electoral systems, and electoral behavior in Peruvian municipalities.*

**Key words:** compulsory voting; development; electoral systems; invalid voting; Peru

### Introduction

This article examines invalid voting in Peru. Invalid voting is an interesting phenomenon in electoral behavior. Voters decide not to abstain in elections and instead participate but cast a spoiled ballot. In some countries, invalid votes account for a trivial percentage of all cast votes and may be explained simply by voter error. However, this is not the case for Peru as a significant number of votes are invalid. In the 2016 presidential election, in the first round, 18% of the votes were declared invalid. As such, Peru has among the greatest percentage of invalid votes worldwide.<sup>3</sup> This fact cannot be completely explained by voter error. Therefore, this article addresses the possible reasons for the great percentage of invalid votes in Peru.

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<sup>3</sup> For example, compare countries' invalid votes in the voter turnout database of the International Institute for Democracy and Electoral Assistance (2020). However, there is a difference in the number of invalid votes across different types of election in Peru. For example, in 2016, several elections were held simultaneously. In the first round of the presidential election, 18% of total votes were invalid. The other two elections had a larger number of invalid votes. 35% of total votes cast were invalid in the parliamentary election. In the Andean parliamentary election, invalid votes amounted to 44% of total votes. These two elections are less important as Peru is a presidential republic.

Furthermore, this article contributes to the current debate on invalid voting. Especially in recent years, the number of articles examining this phenomenon has increased (Kouba, Lysek 2019). Therefore, invalid voting is a topical research agenda in political science. The researchers have recently studied invalid votes comparatively either across countries (Cohen 2018b 2018a; Kouba, Lysek 2016; Lysek, Lebeda, Kouba 2020; Martinez i Coma, Werner 2019; Singh 2018 2019) or within one country (Dejaeghere, Vanhoutte 2016; Fatke, Heinsohn 2017; Fos-sati, Martinez i Coma 2020; Gaebler, Potrafke, Roesel 2020; Hill, Rutledge-Prior 2016; Kouba, Mysicka 2019; Pachón, Carroll, Barragán 2017; Pierzgalski, Górecki, Stępień 2020).

This article addresses possible explanations for invalid voting. First, invalid voting may be linked to socioeconomic variables. Voters may cast invalid votes as a form of political protest toward the political system, or low education may contribute to unintentional voter error (Kouba, Lysek 2019). The socioeconomic approach is often used in the explaining of invalid voting. Therefore, I apply existing theories and research to the Peruvian case as it has not been yet sufficiently analyzed, and it deserves attention due to a high percentage of invalid votes.

Second, invalid voting in the second round of elections may be associated with votes that were cast for parties or candidates eliminated in the first round. The research on voter turnout indicates there is a negative association between turnout in the second round and votes for eliminated candidates in the first round (Bullock, Johnson 1992; De Paola, Scoppa 2014; Pierce 1981; Wright 1989). In the case of compulsory voting, such as in Peru, abstention may transform into invalid votes in the second round. In Latin American countries, the two-round electoral system is examined in relation to the stability of the political system. Some claim that this electoral system may be problematic in Latin America. Scholars argue that plurality voting, unlike runoff voting, hinders the proliferation of presidential candidates and the political fragmentation in the first round. Also, it reduces the likelihood that “outsider” wins in the second round and the risk of divided government (Carey 2003; Domínguez 2003; Linz 1994; Valenzuela 1993). All of these factors can lead to political instability. However, the research on the impact of runoff voting on invalid voting has been non-existent. One may argue that invalid votes are problematic for democracy whether in the form of error or intention. Therefore, it is important to examine whether the institutional design of the electoral system does not affect invalid voting.

In sum, the research aimed to apply existing socioeconomic theories and put forward an innovative explanation of invalid voting related to the institutional design of the electoral system. Also, I placed an emphasis on distinguishing blank and null votes. This differentiation is often lacking in research on invalid voting. I examined three Peruvian presidential elections (held in 2006, 2011, and 2016). I examined elections beginning with those of 2006 as I did not have data available for previous elections that would allow analyzing the local level. I chose presidential elections as Peru is a country with a presidential system. Therefore, one may argue that presidential elections are the most important elections. Moreover, runoff voting is used in presidential elections and enables examination of the second round. I investigated the results of these elections at the municipal level with ordinary least squares (OLS) regression models. Therefore, the studied unit is the Peruvian municipality. I examined the first and second rounds separately and created an original dataset that, in total, includes more than 5,000 cases for each round. I also investigated the difference between null and blank votes<sup>4</sup>.

<sup>4</sup> When ballots do not have a mark for any of the candidates, then they are counted as blank votes (*blancos*). In

I have structured this article into four sections. In the first section, I lay out the theoretical framework on invalid voting and turnout based on existing research, and I present my hypotheses. In the second section, I discuss the methodology. I introduce the dependent, independent, and control variables; present the origin of the data; and explain the reason for including these variables in the regression models. In addition, I clarify the operationalization of these variables. In the third section, I present the context of invalid voting in Peru. In the fourth and last section, I interpret the results of the regression models and discuss the findings.

## Theory

### ***Socioeconomic approach: municipal development***

Researchers analyzing invalid votes have included development as a variable in their studies. Development is treated either as an independent or control variable in invalid voting research, but there does not seem to be clear evidence of the relationship between development and invalid voting, as Kouba and Lysek (2019) demonstrate in their meta-analysis. However, the importance of differentiation between indicators commonly used as the measurement of development must be noted. Kouba and Lysek (2019) correctly test the variables of education and wealth separately. Although education has a higher success rate as a determinant of invalid voting than does wealth, there is no clear consensus in the literature.

The political-protest approach considers invalid votes as a form of protest whereby citizens show their dissatisfaction with candidates or, more generally, with a political system (Power, Garand 2007, 434). While voters in democracies with non-compulsory voting can decide not to participate in elections, this practice is not as simple in countries with compulsory voting, such as Peru. Of course, voters can abstain, but they may face sanctions since voting in Peru is enforced. Compulsory voting is the most important determinant in the prediction of invalid voting (Kouba, Lysek 2019). Tuesta Soldevilla (2003: 56) also considers intentional invalid votes in Peru as active abstention (*abstención activa*), which is present to a large degree because of compulsory voting.

First, the measurement of wealth and economic development in the research on invalid voting should be discussed. The level of wealth and economic development is measured by gross domestic product (GDP) per capita (Aldashev, Mastrobuoni 2019; Cohen 2018a; Isaac, Yescas 2014; Kouba, Lysek 2016; Martinez i Coma, Werner 2019; Power, Garand 2007; Singh 2019) or income (Cisneros Yescas 2013; Hill, Rutledge-Prior 2016; Socia, Brown 2017). Subsequently, there is no clear consensus about the significance of wealth and economic development. The wealth and the level of economic development have no link in the vast majority of studies (Aldashev, Mastrobuoni 2019; Cisneros Yescas 2013; Cohen 2018a; Isaac, Yescas 2014; Kouba, Lysek 2016; Martinez i Coma, Werner 2019; Power, Garand 2007; Singh 2019). The exceptions are studies not using GDP. Socia and Brown (2017) find a positive statistically significant association with invalid voting, while Hill and Rutledge-Prior (2016) find a negative one. The better economic determinant in the prediction of invalid voting is unemployment (Kouba, Lysek 2019). Unemployment has a positive

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the case of null votes (*nulos*), the ballots are spoiled, and it is not possible to determine whether the problem occurred intentionally or through voter error. Therefore, for some, blank votes are a clearer sign of protest (Cohen 2018b, p. 403).

link to invalid voting (Aldashev, Mastrobuoni 2019; Dejaeghere, Vanhoutte 2016; Fatke, Heinsohn 2017; Kouba, Lysek 2016). However, unemployment offers information about the current economic situation rather than overall municipal development. Even though unemployment often corresponds with municipal development.

Education is a part of development indicators. However, although a significant correlation between education and economic indicators can be expected, the effect might be slightly different for invalid voting. Similar to GDP or income, a low level of education may cause dissatisfaction. However, lower education could cause more invalid voting through unintentional voter error. Therefore, in this case, the political-protest approach cannot help explain invalid voting. Furthermore, Driscoll and Nelson (2014) find that voters' education was positively associated with null voting in the 2011 judicial elections in Bolivia. The explanation is that politically sophisticated individuals cast null votes as a form of protest. In contrast, they report the opposite results for blank votes. However, the majority of studies observe a negative association between the level of education and invalid voting (Aldashev, Mastrobuoni 2019; Fatke, Heinsohn 2017; Galatas 2008; Kimball, Kropf 2005; Kouba, Lysek 2016; Kouba, Mysicka 2019; Lysek, Lebeda, Kouba 2020; McAllister, Makkai 1993; Power, Garand 2007; Power, Roberts 1995; Reynolds, Steenbergen 2006; Socia, Brown 2017). The other exception is research on invalid voting in Uruguayan departments (Isaac, Yescas 2014).

Flores Rivas (2017) analyzes the invalid votes of Peruvian university students in his qualitative research. In his dissertation thesis, he confirms that the students cast invalid votes in the 2016 presidential election mainly because of distrust in political candidates and the system. From this point of view, the role of protest is expected to be significant in invalid Peruvian voting. In the research on the 2011 Peruvian presidential election, Zacharías, Sulmont and Garibotti (2015: 189) divide the municipalities into five quantiles based on the Human Development Index (HDI). By using descriptive statistics, they demonstrate that the municipalities in lower quantiles (less developed) have a higher number of invalid votes than the municipalities in higher quantiles (more developed) in the first round. However, this observation needs to be verified with regression models while other variables are controlled, as I do in this paper.

From the literature, I mainly follow the political-protest approach in explaining invalid votes as I assume a strong relationship between the level of education, income, and proneness to protest in the Peruvian case. Therefore, highly developed municipalities should have a lower number of invalid votes for several reasons. First, citizens living in these municipalities should be more content as their socioeconomic conditions are better compared to people living in poorer socioeconomic conditions. Voter discontent may reflect poverty and lack of basic needs, which are prevalent in the low and least-developed municipalities. Hence, I assume that political protest resulting in invalid votes is more likely in poorer municipalities.

Moreover, Peruvian voters do not have the full option to "exit" in Hirschman's (1970) terminology. They could change their choice, and in the next election, vote for a different party. However, dissatisfied citizens might not do that. As an "exit" in the form of abstention would cause sanctions because of the enforced compulsory voting, the voters can only express a "voice" in the form of invalid voting in an election. Second, socioeconomic development is linked with the level of education. I expect that municipalities with an educated populace are less likely to have a larger share of invalid votes by unintentional

error compared to municipalities where residents suffer high rates of illiteracy. Thus, I formulated the following hypothesis:

**H1:** The higher the level of municipal development, the lower the number of invalid votes.

### ***Institutional approach: runoff voting***

Peru uses a runoff voting system for presidential elections. The majoritarian electoral systems are typical for the great number of wasted votes, i.e., votes cast for non-elected parties or candidates. Although runoff can decrease the number of wasted votes in the second round in comparison to plurality, the number of wasted votes can be almost half when the electoral competition is very close. Nevertheless, there is no doubt that votes for eliminated candidates in the first round also have an effect on electoral behavior in the second round as some voters cannot vote for their preferred candidates because they were eliminated.

Research on the link between votes for candidates eliminated in the first round and voter turnout provides some evidence that voters are more likely to abstain in the second round when a preferential candidate or party is eliminated in the first round. In research on the 1967 French legislative elections using survey data, Pierce (1981) finds that participation in the second round is positively associated with sympathy for the most preferred party of the second round among voters who could not repeat their choice from the first round. Therefore, when citizens were alienated from a political option in the second round, they would deliberately decide to abstain. Abstention was especially likely when there was a greater difference in sympathy between the preferred party of the first round and the preferred party of the second round. Pierce (1981) also points out the higher the number of spoiled ballots in the second round in comparison to the first round. Moreover, he sees spoiled ballots as a second alternative to deliberative abstention when the preferred choice of the first round is eliminated.

In the United States, Wright (1989) analyzes voter turnout in the Democratic gubernatorial, senatorial, and congressional primary runoffs held from 1956 to 1984. He finds that turnout in the second ballot is negatively linked with the share of eliminated candidates from the primary vote. Bullock and Johnson's (1992) study runoffs held between 1970 and 1986 in the United States and add state legislative and executive elections. They confirm Pierce's and Wright's conclusions. In the research on electoral turnout in Italian municipal elections, De Paola and Scoppa (2014) also use a sum of votes (as a share of the electorate) for the first two candidates in the first round as a control variable. They confirm that the greater a share votes of the electorate for the advancing two candidates, the greater voter turnout in the second round.

The citizens have three options when their preferential candidates are eliminated. First, they can choose candidates that advanced to the second round. However, this option is problematic when people greatly distrust their political system. They may have a problem choosing even one candidate who they trust in the first round. Second, they can abstain from voting in the second round. However, this option is less likely when sanctions are enforced. Third, they can spoil a ballot. In their meta-analysis of invalid voting, Kouba and Lysek (2019) find that compulsory voting is the most important determinant to predict the number of invalid votes. Therefore, in the case of enforced compulsory voting, I expect that the research examining the relationship between turnout and the share of votes for eliminated

candidates in the first round should correspond to invalid voting and the share of votes for eliminated candidates in the first round. Thus, I formulated the following hypothesis:

**H2:** The greater the share of votes for eliminated candidates in the first round, the greater the number of invalid votes in the second round.

### Blank and null votes in Peru

In general elections, Peruvian voters receive one ballot paper where they vote for the President of Peru, the Congress of the Republic of Peru, and the Andean Parliament<sup>5</sup>. They vote for political parties and candidates by pen and in each election may choose candidates from different parties. Also, they do not have to vote in all three elections. Voters see the name of a political party and its symbol for each election. Moreover, in the presidential election, they also see photos of candidates, and they can give up to two preferential votes for candidates in the elections to the Congress and the Andean Parliament. Each symbol and photo of the candidate is in the box (square), and voters must mark the symbol, photo or both with a cross or saltire for the vote to be valid. Blank votes are those that have no mark on the ballot, and null votes do not meet the requirements to be valid<sup>6</sup>. In this electoral design, there is a scope for voter error. The most frequent errors are marking outside the symbol or photo, marking other lines on the ballot paper, and signing the paper with the voter’s name as that also invalidates the ballot (Tuesta Soldevilla 2001: 53-54). Of course, there also other reasons why votes are null. However, these reasons can be hardly related to voter error such as broken ballots or ballots with expressions, phrases or signs that do not relate to the electoral process.

**Table 1: Blank and null votes (%) in Peru - the presidential elections**

	2006	2011	2016
<b>First round</b>			
Blank votes	11.9	8.8	11.9
Null votes	4.2	3.5	6.2
Turnout	88.7	83.7	81.8
<b>Second round</b>			
Blank votes	1.1	0.7	0.8
Null votes	7.4	5.6	5.7
Turnout	87.7	82.5	80.1

**Source:** ONPE.

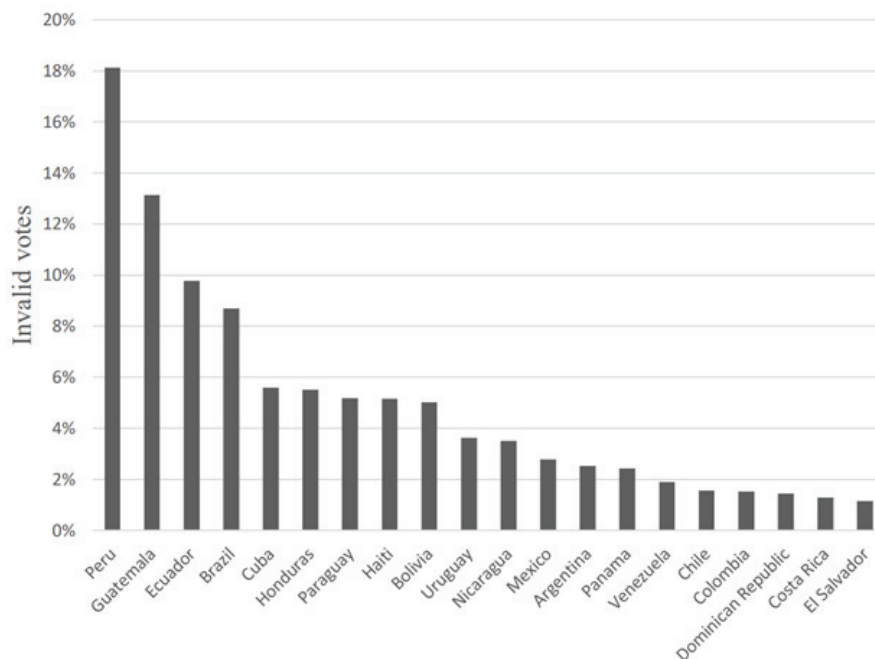
<sup>5</sup> The Andean Parliament is the political organ and deliberative body of the Andean Community. The parliament consists of 25 representatives from Bolivia, Colombia, Ecuador, Peru, and Chile.

<sup>6</sup> However, in Peruvian elections, votes are also considered null when election results announced by polling stations are annulled (*actas anuladas*). When the election results are annulled, the votes from that polling station are considered null, which is a problem for the analysis as it is not possible to differentiate these votes from votes cast as null by voters in municipalities. Reported results and models include all municipalities. However, for the robustness check, I made several other models that excluded any municipality with the annulled result. The B coefficient changed only slightly, and the results and conclusions of research did not change. These robustness check models are not reported in this paper.

Table 1 shows the percentage of blank and null votes in the past three presidential elections (2006, 2011, and 2016). Even though the total percentage of blank and null votes differs, each election follows the same pattern. In the first round, there are more blank votes than null votes. On the contrary, in the second round, there are more null votes than blank votes. Therefore, it is important to distinguish carefully between null and blank votes in Peru as I do in the analysis. It seems that both types of votes may have a completely different dynamic in each round. Voter error is less likely in the second round as voters receive a ballot with only two candidates. On the contrary, the first round is more complex as voters also see elections on the ballot to other governing bodies and all presidential candidates. Therefore, while in the first round null votes might express voting error, instead, in the second round, when there are higher rates of null votes (but lower rates of blank ones), null votes might express rather discontent than voting errors. In the first round, some voters may wish to vote only in elections to other governing bodies. Therefore, their obvious choice is not to mark any presidential candidate, instead tearing the ballot as it would invalidate also other elections. However, in the second round, it makes sense to show discontent by tearing the ballot as it does not affect other elections. Also, in the first round, voters may not have decided yet on a presidential candidate and so cast blank votes. Their decision is much easier in the second round as they choose only from two candidates, and they may perceive the second round as more important as the winner becomes the president.

For comparison, whether the numbers in Table 1 are high or low, Figure 1 shows the percentage of invalid votes in other Latin American countries. In Figure 1, the percentage of invalid votes is presented in the last presidential elections<sup>7</sup>. It is possible to see that the percentage of invalid votes in Peru exceed those in other Latin American countries.

**Figure 1: Invalid votes in Latin American countries**



**Source:** Graph created by author; data from *International Institute for Democracy and Electoral Assistance (2020)*, but numbers percentages were verified at national electoral authorities.

<sup>7</sup> As of November 1, 2020. If elections had two rounds, then only the number of invalid votes is presented in the first round. In the case of Cuba, official results of parliamentary elections are given.



## Methodology

### Data

I used data from several sources. First, the National Office of Electoral Processes (*Oficina Nacional de Procesos Electorales*, ONPE) provided election results (ONPE 2016). I drew data about municipalities from the National Institute of Statistics and Informatics (*Instituto Nacional de Estadística e Informática*, INEI) and the United Nations Development Programme (UNDP). I examined the past three presidential elections, held in 2006, 2011, and 2016, and analyzed the first and second rounds of elections separately. Municipalities with insufficient data<sup>8</sup> were filtered out. Therefore, I used data at the aggregate level.

There are advantages and disadvantages to using aggregated data in examining invalid voting. The greatest disadvantage is that making an inference to the behavior of individual voters is problematic because there is a great risk of ecological fallacy. Thus, this disadvantage is the main limitation of this research. Although data at the Peruvian individual level are available in public opinion surveys, these data are also highly problematic. First, the data cannot offer information about unintentional voter error as invalid votes are self-reported. In this case, examining the relationship between the level of education and invalid voting by voter error does not make sense.

Moreover, as public opinion surveys indicate, the rate of self-reported invalid votes is significantly lower than the official rate. In the Latin American Public Opinion Project's survey, 5% of respondents who voted in the 2016 presidential election said that they cast invalid votes in the first round (AmericasBarometer 2017), and in the Comparative Study of Electoral Systems' (2018) survey, 7% of respondents answered the same. However, the true share of invalid votes was 18.1%. Although these discrepancies may be caused by sampling error, the inconsistencies are present in both opinion surveys. Furthermore, voters can make an unintentional error during voting, and respondents can lie or not recall their true votes. Therefore, even though this research cannot reliably explain the reasons individuals cast invalid ballots, it can examine variation across Peruvian municipalities.

### Dependent variables

I examined the first and second rounds separately. Also, I analyzed null and blank votes both together and individually. Therefore, the number of dependent variables is seven<sup>9</sup>.

### Independent variables

The first independent variable is the level of development. I used the HDI to measure the level of development. This measurement is common for research that examines development. Furthermore, I used information about income and education from the dataset

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<sup>8</sup> Unfortunately, data from the UNDP are missing for municipalities that were created in recent years. Also, previous presidential elections (2006 and 2011) were not held in recently created municipalities.

<sup>9</sup> The dependent variables are following: in the first round (1) total invalid votes (blank + null votes), (2) blank votes, and (3) null votes; and in the second round (4) total invalid votes (blank + null votes), (5) blank votes, (6) null votes, and (7) difference between invalid votes in the first and second round (invalid votes in the second round minus invalid votes in the first round).

provided by the UNDP and the INEI. However, the UNDP does not offer data for every year. I used the last report from 2013 (UNDP 2013) that offered these data. For each election, I chose the closest year in a report that had calculated the HDI and information about income: 2012 for the 2016 election, 2011 for the 2011 election, and 2007 for the 2006 election. The variable of income is the average family income per capita in Peruvian soles in municipalities. However, I logged this variable since income is heavily skewed. Researchers examining invalid voting use this variable as the level of wealth (Cisneros Yescas 2013; Hill, Rutledge-Prior 2016; Socia, Brown 2017). The variable of illiteracy provides information about a share of the population over 15 years old in municipalities who cannot read and write. The illiteracy rate is also often part of research related to invalid voting (Kouba, Lysek 2016; Kouba, Mysicka 2019; Lysek, Lebeda, Kouba 2020; Power, Garand 2007; Power, Roberts 1995). I used the INEI data (*tasa de analfabetismo*) from the 2007 and 2017 census. The census of 2007 was used for 2006, the census of 2017 for the 2016 election, and the mean between the census of 2007 and 2017 was used for the 2011 election.

The second independent variable is the share of votes for eliminated candidates in the first round. I counted the number of votes for candidates who did not advance to the second round for each election as the total vote share in a percentage of eliminated candidates in a first round who did not proceed to a second round.

### **Control variables**

The first control variable is the indigenous population. Peru is a country with a significant<sup>10</sup> indigenous population. In heterogeneous countries, how different ethnic or racial groups politicize is crucial. In some cases, different groups may not act significantly differently, and ethnic or racial cleavage does not exist. Unlike in Peru's neighboring Andean countries, Bolivia and Ecuador, the research on indigenous movements has emphasized failing indigenous movements in the Peruvian political system (Madrid 2011; Van Cott 2005). However, based on surveys, Raymond and Arce (2013) argue that indigenous voting divisions have indeed emerged in Peru. In their research, they demonstrate that indigenous peoples supported significantly different presidential candidates than the mestizo population in 2001 and 2006. These political lines may also extend to invalid voting.

Some researchers use ethnicity and race as an independent or control variable when they examine invalid votes. For example, Kimball and Kropf (2005) and Socia and Brown (2017) find that the number of invalid votes increases with the share of African-Americans in a county or a municipality. In Belgium, Dejaeghere and Vanhoutte (2016) find that the Walloon Region and German-speaking community have a greater number of invalid votes. In Australia, McAllister and Makkai (1993) see statistically significant differences across a different immigrant population in connection to invalid voting. Finally, in neighboring Bolivia with aggregated municipal data, Driscoll and Nelson (2014) find that the indigenous population has a greater likelihood of casting a null vote and lower likelihood of casting a blank vote than the rest of the population. However, they do not confirm these results at the individual level.

Indigenous populations can be calculated through various methods. For example, the calculation can be made by self-identification, mother, or spoken language in the household (Springerová and Picková 2018; Trivelli 2005, 10). I chose to measure the indigenous

<sup>10</sup> The size of indigenous population depends on the indicators and their measurement of the indigenous population. The estimates range from 19% to 75% depending on the indicator (Sulmont 2011: 54).

population as the share of people in municipalities with a mother language other than Spanish but considered a language of the indigenous population. This operationalization is often practised when calculating indigenous people in Peru (Holland, Incio 2019: 13; Sulmont 2011: 54; Trivelli 2005). I drew data from the 2017 census and the 2007 census provided by the INEI. For the 2006 election, I chose the 2007 census; for the 2016 election, I used the 2017 census; and I used the mean of these two censuses for the 2011 election to obtain the most accurate results.

The second control is a share of the electorate under the age of 30. I drew these data from the National Jury of Elections (*Jurado Nacional de Elecciones*, JNE), which offers information about age (Infogob-JNE 2017). Citizens under 30 are considered young voters (*electores jóvenes*). This variable appears in studies related to invalid voting (Cisneros Yescas 2013; Dejaeghere, Vanhoutte 2016; Fatke, Heinsohn 2017; Galatas 2008; Hill, Rutledge-Prior 2016; Kimball, Kropf 2005; Socia, Brown 2017) and is usually measured by a share of the population/electorate of either an older age or a younger age. In this research, I chose to control a share of the younger electorate as citizens in Peru over the age of 70 are not sanctioned for abstention in elections (Álvarez, Tuñón, Feierherd 2019: 141). Therefore, they do not have to worry about possible sanctions, unlike other voting-age citizens. Moreover, in the social science literature, age is often connected to explaining protests. Young people participate in protests more often than the elderly (Barnes et al. 1979; Dalton 1996). Furthermore, some evidence suggests that young people may indeed be more likely than the rest of the population to cast invalid votes (Cisneros Yescas 2013; Dejaeghere, Vanhoutte 2016; Hill, Rutledge-Prior 2016). I did not include the share of the electorate over 70 years because of a high correlation<sup>11</sup> with the electorate under the age of 30 as it would lead to multicollinearity.

The third control variable is turnout. I included this variable in models because of compulsory voting in Peru. In countries without compulsory voting, citizens can manifest their distrust or dissatisfaction with political parties by not casting a ballot. However, when voting is compulsory, voters are more likely to vote in elections as they do not want to risk sanctions for abstention, but they can cast invalid ballots as a form of protest. Therefore, in municipalities, voter turnout may be associated with the number of invalid votes.

The fourth control variable is the size of the electorate. I used the size of the electorate rather than the population as data about the electorate are precise for each election. For population, I would have to use estimates based on the last census. However, because of the very high correlation<sup>12</sup>, these numbers could be used interchangeably. I logged the electorate as there are significant differences in population between the most- and least-populated municipalities. Population or size of the electorate are standard control variables for research related to invalid votes, electoral turnout (Cancela, Geys 2016; Geys 2006; Stockemer 2017), and electoral behavior in general. Therefore, I controlled for this variable.

Urbanization is often part of the research examining invalid votes. Voters living in urbanized areas tend to have more information about an upcoming election which in turn should lead to fewer invalid votes. Moreover, these voters also have better access to information and political organizations that should reduce the number of invalid votes (Power,

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<sup>11</sup> The Pearson correlation coefficient is -0.738. The variable was included in models and the levels of the variance inflation factor (VIF) were increased.

<sup>12</sup> The Pearson correlation coefficient between the size of the population based on the census of 2007 and the electorate in 2006 is 0.974.

Garand 2007: 437–439). However, in the literature, urbanization's effect on invalid votes is unclear. While most research (Kouba, Lysek 2019) finds a negative relationship between the level of urbanization and invalid votes (Herron 2011; Isaac, Yescas 2014; Kimball, Kropf 2005; Pachón, Carroll, Barragán 2017; Power, Garand 2007), some researchers observe the opposite relationship (Aldashev, Mastrobuoni 2019; Cisneros Yescas 2013; Fatke, Heinsohn 2017; Power, Roberts 1995). Driscoll and Nelson (2014) report a positive association between urbanization and self-reported null votes and a negative association between urbanization and blank votes at the individual level. However, I did not include urbanization as a control variable in the main models reported in the research. In the Peruvian census of 2017, the INEI considered all populated areas with under 2,000 inhabitants as rural<sup>13</sup>. Therefore, the variable of the electorate provides similar information<sup>14</sup> and offers greater detail.

I analyzed three presidential elections. Each election had different candidates, topics, campaigns, and other variances related to each election. The presidential candidates in different elections can have a great effect on voters' electoral behavior. A high number of candidates has a positive association with invalid voting (Cohen 2018a). Each year can also have different economic conditions. These are all factors that contribute to the possibility of casting an invalid vote. Because the theoretical framework of invalid voting also expects invalid voting to be an intentional act caused by dissatisfaction with political or economic conditions (Kouba, Lysek 2019; Power, Garand 2007), these differences must be controlled. I created two dummy variables<sup>15</sup> representing elections. My reference category was an election in 2011 because it had the fewest invalid votes.<sup>16</sup>

## **Models**

I used the OLS regression as the values of the dependent variables are continuous. In total, I created seven OLS regression models<sup>17</sup>. Moreover, the variable of the share of votes for the candidates eliminated in the first round was only included in models 4, 5, 6, and 7 examining the second rounds. I examined the total number of invalid votes in models 1 and 4 (including null and blank votes), blank votes in models 2 and 5, and null votes in models 3 and 6. I proceeded with caution to avoid multicollinearity; the highest variance inflation factor (VIF) in all models was 2.66, and the average value was 1.87. In addition, I checked the condition index, and no variable reached critical values (Belsley, Kuh, Welsch 2005) that would suggest a problem with multicollinearity.

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<sup>13</sup> The INEI also used the second criterion that urban areas need to have a minimum of 100 dwellings grouped contiguously (INEI 2018).

<sup>14</sup> Subsequently, the Pearson correlation coefficient is 0.695. Moreover, when I interchanged these two variables in the OLS regression models, the association between independent variables and dependent variables did not change, and the B coefficient changed only slightly.

<sup>15</sup> The dummy variables have the following values: the 2011 election had 0 and 0 (reference category), the 2006 election had 1 and 0, and the 2016 election had 0 and 1.

<sup>16</sup> There were 8.9% of invalid votes in the 2011 election. The 2006 and 2016 elections both had more than 12% of invalid votes. These numbers reflect both rounds.

<sup>17</sup> I created also other models such as a log-linear model, a simple pooled model, and I modeled each election separately. The results and conclusions of the research did not change in these models.

**Results**

Table 2 offers descriptive statistics. I report the OLS regressions in Table 3.

**Table 2: Descriptive statistics**

Statistic	N	Mean	St. Dev.	Min	Max
Blank + null votes – first round	5,478	21.94	8.43	1.75	74.53
Blank votes – first round	5,478	17.22	6.79	0.42	50.06
Null votes – first round	5,478	4.72	3.79	0.00	64.96
Blank + null – second round	5,478	7.72	4.15	0.46	41.79
Blank votes – second round	5,478	1.43	1.02	0.00	10.95
Null votes – second round	5,478	6.29	3.69	0.00	40.52
Difference between rounds in invalid votes	5,478	-14.22	7.25	-66.80	16.11
HDI	5,478	0.31	0.12	0.07	0.80
Income	5,478	5.61	0.59	3.91	7.57
Illiteracy	5,478	12.92	8.33	0.22	50.42
Eliminated candidates	5,478	38.40	18.86	0.50	95.75
Indigenous population	5,478	31.24	35.28	0.00	99.29
Age (Youth)	5,478	30.73	5.47	8.30	48.76
Turnout – first round	5,478	81.14	9.13	31.95	96.81
Turnout – second round	5,478	78.97	9.91	16.45	96.32
Electorate (logged)	5,478	7.99	1.37	4.63	13.45

Source: Author’s calculations.

The first hypothesis concerns the level of development. The range between a municipality with the lowest and highest scores of the HDI is 0.73. The first model predicts that a municipality with the lowest HDI would have 30% more invalid votes than a municipality with the highest score, while all other variables are controlled. As models 2 and 3 confirm, socioeconomic indicators are important for both blank and null votes. Model 4 includes the second round, and in this case, the model predicts the difference between municipalities with the highest and the lowest levels of development would be 9% more invalid votes, while other variables are controlled. Models 5 and 6 confirm these findings for blank and null votes. The higher the level of municipal development, the lower the number of invalid votes. The same results are for both income and illiteracy in models 2, 3, 5, and 6. Therefore, the first hypothesis is confirmed. Municipalities with populations that earn more and are more literate are less likely to have more invalid votes than municipalities with low-earning and less educated populations. These findings are true for both blank and null votes. Although voters can cast null votes by intentional error, this is hardly the case for blank votes. In the first round of elections, model 2 predicts 21% more blank votes in a municipality with the largest share of the illiterate population than in a municipality with the smallest share.

Table 3: OLS regressions: invalid votes

	Dependent variable:						
	Blank + null	Blank	Null	Blank + null	Blank	Null	Difference between rounds
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
HDI	-41.644***			-13.198***			
	(0.897)			(0.485)			
Income		-1.948***	-0.660***		-0.001	-1.239***	1.175***
		(0.157)	(0.127)		(0.027)	(0.103)	(0.197)
Illiteracy		0.429***	0.096***		0.074***	0.061***	-0.377***
		(0.011)	(0.009)		(0.002)	(0.007)	(0.014)
Eliminated candidates				0.094***	0.009***	0.083***	0.116***
				(0.002)	(0.001)	(0.002)	(0.004)
Indigenous population	0.034***	-0.015***	0.004*	0.034***	-0.002***	0.023***	0.034***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.0004)	(0.001)	(0.003)
Age (Youth)	0.097***	0.103***	0.050***	-0.004	0.002	0.013	-0.136***
	(0.017)	(0.013)	(0.010)	(0.009)	(0.002)	(0.008)	(0.016)
Turnout – the 1st round	-0.146***	-0.176***	-0.003				
	(0.011)	(0.008)	(0.007)				
Turnout – the 2nd round				0.049***	-0.008***	0.049***	0.232***
				(0.006)	(0.001)	(0.005)	(0.010)
Electorate	0.741***	-0.444***	0.400***	0.657***	-0.044***	0.493***	0.460***
	(0.075)	(0.056)	(0.045)	(0.039)	(0.010)	(0.036)	(0.069)
<b>Elections (reference category 2011)</b>							
2006	5.253***	5.047***	1.161***	1.437***	0.670***	0.928***	-4.936***
	(0.221)	(0.175)	(0.141)	(0.117)	(0.031)	(0.115)	(0.220)
2016	4.731***	2.628***	2.416***	0.866***	0.068*	0.927***	-4.203***
	(0.191)	(0.147)	(0.118)	(0.110)	(0.028)	(0.105)	(0.201)
Constant	33.605***	35.159***	1.399	-2.610***	0.879***	-0.282	-36.232***
	(0.882)	(1.030)	(0.832)	(0.450)	(0.176)	(0.659)	(1.263)
N	5,478	5,478	5,478	5,478	5,478	5,478	5,478
R <sup>2</sup>	0.563	0.605	0.174	0.506	0.481	0.437	0.463

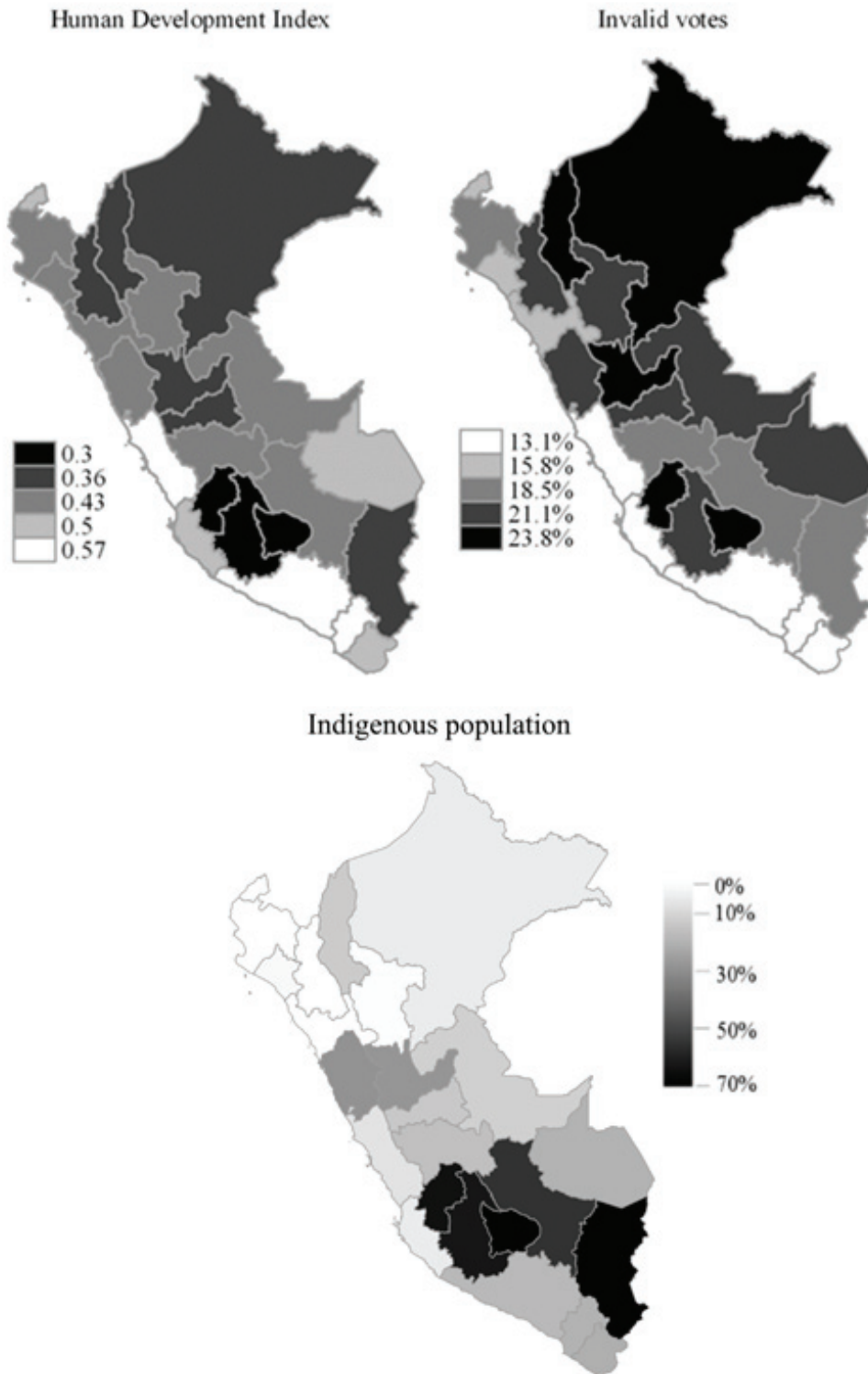
Note: Standard errors in parentheses, \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001.

Source: Author's calculations.

The findings concerning the significant positive association between the level of development or wealth and invalid voting are in contrast with most studies about invalid voting, which do not find any link (Aldashev, Mastrobuoni 2019; Cisneros Yescas 2013; Cohen 2018a; Isaac, Yescas 2014; Kouba, Lysek 2016; Martinez i Coma, Werner 2019; Power, Garand 2007; Singh 2019). Researchers usually measure the level of development and wealth by GDP (Aldashev, Mastrobuoni 2019; Cohen 2018a; Isaac, Yescas 2014; Kouba, Lysek 2016; Martinez i Coma, Werner 2019; Power, Garand 2007; Singh 2019) as they often compare countries. When measuring wealth by income, the findings are in accordance with Hill and Rutledge-Prior (2016), who examine invalid voting in Australia. Therefore, the link between the level of wealth and invalid voting seems heavily dependent on the context of the country. However, for the association between education and invalid voting, the findings are in accordance with the majority of the literature (Aldashev, Mastrobuoni 2019; Fatke, Heinsohn 2017; Galatas 2008; Kimball, Kropf 2005; Kouba, Mysicka 2019; Lysek, Lebeda, Kouba 2020; McAllister, Makkai 1993; Power, Garand 2007; Power, Roberts 1995; Reynolds, Steenbergen 2006; Socia, Brown 2017). The second hypothesis dealt with the feature of runoff. Models 4 to 6 show there is a statistically positive association between votes for the candidates eliminated in the first round and invalid votes in the second round. The range between municipality with the highest share of votes for eliminated candidates and the lowest number is more than 95%. In this case, model 4 predicts that a municipality with the highest number would have 9% more invalid votes while all other variables are controlled. Models 5 and 6 show that a positive association between votes for the candidates eliminated in the first round and invalid votes in the second round is also true for blank and null votes separately. In the second round, the number of null votes is greater than blank votes. Therefore, the B coefficient is almost nine times higher for null votes than blank votes. Also, model 7 shows that votes for eliminated candidates increase the difference between the number of invalid votes between the first and second round. Hence, the second hypothesis is confirmed. These findings are in accordance with literature examining voter turnout in the second round and the share of votes for candidates eliminated in the first round (Bullcock, Johnson 1992; De Paola, Scoppa 2014; Pierce 1981; Wright 1989). Therefore, it seems that it may be indeed true that electoral abstention transforms into invalid voting in the second round when enforced compulsory voting is present.

Models 3 and 5 indicate that a municipality with a greater share of the indigenous population is more likely than a municipality with a smaller share to have more null votes. However, in the case of blank votes, the results are the opposite. Therefore, in this case, there is a difference between blank or null votes in the first and the second rounds. The difference between a municipality with the largest share of the indigenous population and the smallest share is almost 100%. Therefore, model 1 predicts more than a 3% difference in invalid votes in the second round, and model 4 predicts the same percentage in the second round. However, the indigenous population suffers from a high illiteracy rate, and after controlling this variable, only null votes are significant. This may indicate that the indigenous population because of discontent rather break ballot paper than cast a blank ballot.

Figure 2: Map of departments: the HDI, indigenous population, and invalid votes in the 2016 presidential election in the first round



Source: Map created by author; data from the UNDP (2013), INEI (2018), and ONPE (2016).



Figure 2 illustrates the distribution of invalid votes across Peruvian departments<sup>18</sup>. Figure 2 also shows the indigenous population in departments. Invalid voting is clearly heavily disproportionate in Peruvian departments. The departments with the highest percentage of invalid votes have almost twice as many invalid votes as the departments with the lowest percentage. Peru is traditionally geographically divided into three parts: *costa*, *sierra*, and *selva*. These three regions differ from each other by their climate and vegetation. To the west, there is *costa*, which is a long and narrow coastal region between the Pacific Ocean and the foothills of the Peruvian Andes. It is characterized by a warm or temperate climate with low rainfall. *Sierra* is located between *costa* and *selva*. It is the mountainous and highland region. This region is typical of the Andean culture of Peru. Mountain climate varies from temperate to cold depending on the altitude. To the east, there is *selva*. It is the Peruvian Amazon, the part of the Amazon rainforest with some of the greatest biodiversity on the Earth. It has the lowest population density in Peru. As the map of invalid votes shows, *selva* has a high share of invalid votes. *Sierra* also has a significant share of invalid votes, and *costa* has the lowest share. The departments are significantly different from each other in the level of development and ethnic composition, among other factors. In Figure 1, the map on the left presents the HDI<sup>19</sup> across the departments, which illustrates the correlation between the HDI and invalid votes at the departmental level. The regression models examined these variations across Peru at the municipal level.

## Conclusion

I examined invalid voting in Peru as it was an ideal country for studying this phenomenon. Peru has among the greatest percentage of invalid votes worldwide. I studied three presidential elections, held in 2006, 2011, and 2016, at the municipal level and analyzed both rounds of elections separately, distinguishing between blank and null votes. I based my theoretical framework on previous research on invalid voting.

The first explanation was linked to socioeconomic variables. As mentioned in the text, researchers usually measure the level of development and wealth by GDP. This measurement has several disadvantages. GDP does not provide the full picture of the well-being of the population. It is only a measurement of economic production. For example, natural disasters and wars can raise GDP. Therefore, I measured the development of municipalities using the HDI. The HDI, unlike GDP, accounts for population education and health. It is much better suited for examining development. However, even this index has disadvantages; for example, it does not account for inequality in society that may affect life satisfaction. I found that the greater the HDI of a municipality, the fewer invalid votes. It is important to emphasize applied measurement because researchers using GDP (Aldashev, Mastrobuoni 2019; Cohen 2018a; Isaac, Yescas 2014; Kouba, Lysek 2016; Martinez i Coma, Werner 2019; Power, Garand 2007; Singh 2019) found no link to invalid voting.

It may be reasonable to expect that municipalities with a greater share of the population that is literate are likely to have fewer invalid votes due to fewer voter errors. I confirmed this expectation in Peru. However, a less-educated population also casts more blank votes. Null votes may be unintentional errors or a form of protest, but blank votes arguably cannot

<sup>18</sup> I chose to visualize invalid votes at the departmental level because of the great number of municipalities. Moreover, there is a large variance in areas of municipalities that make a visualization map at the municipal level unclear.

<sup>19</sup> The data from 2012, as mentioned.

be mistakes by voters. Blank votes might be considered as an indicator of alienation, discontent, or dissatisfaction with the parties and candidates in an election with compulsory voting. Null votes can express either discontent or voter error, and the aggregate nature of the data makes it difficult to unravel this problem. However, in this study, socioeconomic variables had a statistically significant association with either blank or null votes. Therefore, similar to income, insufficient education of the local population may be seen as a factor linked to indifference or discontent about an overall life situation in municipalities.

Second, I studied the relationship between the share of votes for candidates eliminated in the first round and invalid votes in the second round. I found that municipalities with a greater share of votes for eliminated candidates are more likely to have more invalid votes in the second round. While electoral abstention in elections may be the case for runoff in other countries, Peru has enforced compulsory voting that discourages abstention.

This article contributed to the current debate on invalid voting, which is a topical research agenda in political science. The case of invalid voting in Peru has not yet been properly studied. Moreover, all findings in the article are an important contribution to the topic.

None of the two possible explanations has sufficient consensus in the literature about their association with invalid voting. Therefore, testing these variables with different cases is important to determine possible links to invalid voting. Moreover, even though there is a significant amount of literature about the possible problems of runoff voting on political systems (Carey 2003; Domínguez 2003; Linz 1994; Valenzuela 1993), no research has been done on the association between runoff voting and invalid voting. Therefore, in this sense, it is a brand new innovative study.

Further research could be directed to other countries with a high number of invalid votes to examine whether results from this study also hold in them. From Figure 1, it seems that good candidates for this research could be Guatemala, Ecuador, or Brazil. Particularly, researchers should test the impact of candidates eliminated in the first round, for a runoff voting system, on electoral behavior in the second round. Electoral systems are very important for the quality of democracy. In the context of compulsory voting, it is worth considering whether voting should be plurality or runoff. The article suggests that when the population is forced to cast a ballot in the second round and their preferred candidate was eliminated in the first round then it is more likely that that ballot will be invalid, and some may consider a high number of invalid votes harmful to democracy.

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