Elections in the economic crisis: Patterns and dynamics of Greek party systems during the 2009-2015 period

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This article investigates the geography of Greek, parliamentary elections during 2009-2015, which is a significant part of the period of the Greek, debt crisis. The unit of analysis is the Greek municipality, and the focus is on the geography of left and right party vote, a dichotomy that shapes Greece. Geographical understanding of Greek elections during the aforementioned period regards several points of the Greek, political spectrum, and a number of specific parties. Nevertheless, those findings do not examine the relative power of ideology or party power. Thus, two basic questions were formed, the one of which searches for places where the left dominates the right and vice versa, for a certain period of time. The second question asks which of those places underwent a process of dominance inversion, regarding the left-right dipole. In order to answer the first problem, a spatial weights matrix was carefully chosen, and the notion of a matrix of false dominance of left over right and vice versa was introduced and used. The second problem was solved by defining eight types of inversion, and by characterizing the discovered inversions. First-question results include localities of left-over-right dominance and vice versa, which last only two, consecutive elections. Second-question results include only two inversions, both from right to left. A summary of the results possibly reveals an unstable, electoral, Greek-crisis geography, with subtle elements of a more stable left geography than its counterpart. The findings merit an attempt for explanation by social or political science.

Keywords: Greece; crisis; elections; spatiotemporal; ideology
Introduction

Greece entered the period of harsh austerity approximately in 2011. During this period, Greek politics and society have changed radically. It is important to investigate the nature of these changes. A component of Greek politics are the elections. The present study focuses on the Geography of Greek, parliamentary elections of the period 2009-2015, and in particular, on the Geography of left and right vote.

The current study aims to increase knowledge about the relationship between the Greek left and right, which is a dichotomy that has shaped and continues to shape the political and societal status of Greece. This study also provides interesting findings for political and social scientists to explain. In addition, the study proposes a method for the spatiotemporal analysis of elections.

The first question under investigation asks whether there are any Greek, intertemporal localities of right-over-left dominance and vice versa. The second question seeks the aforementioned localities that were inverted, and what the characteristics of these inversions are.

The problem under investigation has been examined by two graduate-school assignments. One of them researches the geographical distribution of the vote of the Greek parties “Chrysē Augē”, “Enwsē Kentrōōn”, and “SYRIZA”, during the Greek-austerity period. The second assignment examines the geographical distribution of the vote of left-right dichotomy, and refers to the same time period. The two assignments use local, spatial autocorrelation measures, group parties by ideological criteria, and attempt to explain vote by social and economical indices. The work mentioned above pays little attention to the choice of a proper, weights matrix, which is of great importance for the analysis. The same happens with the statistical significance which characterizes all results.

The two questions of this study can be understood as two goals. The question that seeks intertemporal localities of a specific kind of dominance is a sub-goal of the question that seeks inversion of dominance. In other words, the answer to the first question is the basis for the second one. As a result of that, the method that achieves the second goal contains a few more steps compared to the first method.

The first method's key steps are the careful selection of a weights matrix, the construction of a proper matrix of false, intertemporal localities of right-over-left dominance and vice versa, and the discovery of such localities. The second method just adds the detection of the subset of localities of the first goal, whose status was inverted, and the determination of some characteristics of the process of inversion.

As far as the structure of the article is concerned, it begins with an explanation of important, and in some cases new notions used in the study, in the “Background” section. The “Method” section contains a detailed explanation of the presented methods, and describes their application to the problem under investigation. “Results” includes the findings of the study, and “Conclusions” includes commentary on the validity of the findings, interpretation of the findings, some fact-based
speculation about the general picture of the findings, a weakness and positive elements of the proposed method, and suggestions for the expansion and modification of the study.

**Background**

Tobler's law is a major principle in the field of Geography. Tobler states that “...everything is related to everything else, but near things are more related than distant things.”.

Another important and fundamental idea is “neighborhood”. A neighborhood refers to a central, spatial unit, which, in the present study is a municipality. There are several ways to define the neighborhood of every spatial unit of the study area. It is important to note that any spatial unit that does not belong to the selected neighborhood of the central, spatial unit, does not interact with the central unit in the study framework.

For a given, central, spatial unit, its neighborhood, and a spatial variable, it is possible to compute the spatial lag. The spatial lag is the weighted mean of the values of the variable, which correspond to each of the neighbors of the central, spatial unit. The spatial lag depicts the values of the variable under study in the neighborhood of a specific, spatial unit, and can be compared to the central value.

The aforementioned Tobler's law becomes concrete with the notion of spatial autocorrelation. Spatial autocorrelation refers to how similar the attributes of a set of spatial units are, as the distance of the units decreases. Tobler's law corresponds to a special case of spatial autocorrelation, which is called positive. On the other hand, negative, spatial autocorrelation refers to a spatial distribution of a variable, where, as the distance between spatial units decreases, the spatial units' values of the variable diverge increasingly. The third case is the so-called, null hypothesis, which corresponds to a spatially random variable.

Spatial autocorrelation, as mentioned above, provides information about a spatial distribution as a whole. Local, spatial autocorrelation refers to a specific, spatial unit of the whole pattern, and the units' neighborhood. There are four categories of local, spatial autocorrelation. The first one is called “high-high” and contains spatial units where the variable takes a value greater than the mean of the whole distribution, and whose spatial lag is also greater than the mean of the spatial lags of the distribution. The second category is called “low-low”, and possesses the inverse properties of “high-high”, but does not appear in the present study so, any further explanation is omitted. Negative, local, spatial autocorrelation includes two categories, “high-low”, and “low-high”. The first one, which concerns the present study as shown at the “Results” and “Conclusions” sections, contains spatial units whose value surpasses the mean of the distribution contrary to their neighborhood, whose spatial lag is lower than the respective mean. The second one contains spatial units whose value is lower than the mean of the distribution, contrary, again, to their neighborhood, whose spatial lag is higher than the mean of spatial lags of the study area.
In order for a location and its neighborhoods to be called a “high-high” or a “high-
low”, another property is necessary. The distribution must not be random. In other
words, the local, null hypothesis must be false. The way to check this is by
comparing the statistical significance of the locality with a statistical-significance
threshold. The lower the threshold, the stricter the test.

Geography says that spatial autocorrelation results from first and second order
effects. First-order effects refer to the properties of the environment where the
variable under study is positioned. For example, if the variable is the percentage of
the surface covered by a specific type of plants, referring to a spatial unit such as the
municipality level, then a first-order effect could be the amount of rain that falls at
each spatial unit. Second-order effects refer to the interaction between the
observations of a specific variable. For example, the percentage of people that have
a specific accent at a defined, spatial unit, probably affects this percentage in adjacent,
spatial units.

Geography includes Human Geography among other disciplines. In Human
Geography, first-order effects correspond to compositional effects. This type of
effects refers to what a person is and possesses. For example, in the case of elections,
a voter's economic or power status will probably affect what he will vote. Second-
order effects correspond to contextual effects. A voter's choice can be affected by
political discussions he has with neighbors of his/her. This phenomenon is called “the
neighborhood effect”.

Spatial autocorrelation, which was mentioned above, is measured by formulas that
attempt to quantify location and attribute similarity. Some of these formulas involve
a “spatial weights matrix”, which is an attempt to measure the location-similarity
part. The spatial weights matrix contains the weights that refer to every possible pair
of spatial units, that together form the study area. The rows of the matrix correspond
to every spatial unit, form one to n, and the same applies to the columns. Thus, the
matrix is first-diagonal symmetrical and the first diagonal's elements equal zero since
in most analyses avoid self-neighborhood. So, for example, the first-row – second-
column element is the location-similarity measure of spatial units one and two. The
same applies to the symmetrical element of row two and column one.

Moving on to notions that specifically refer to the current study, a locality of
dominance of left-over-right vote refers to a municipality and its neighbors. Such a
locality is a high-high of the variable “left vote divided by right vote”. The second
property of such a locality is that more people voted left than right in the central
municipality. Essentially, a locality of dominance of some variable is an extended
notion of the traditional high-high. A high-high does not suffice for the current study,
since it does not ensure that left vote surpasses right vote. In other words, in the case
of left-vote-divided-by-right-vote variable, a locality is a cluster of higher-than-mean
values, centered around a municipality where the variable numerator exceeds the
denominator. An intertemporal locality of dominance of left over right vote is a set of
consecutive-elections localities of the type described above. The notions described
above apply in the same way for the inverse variable of right-divided-by-left vote.
Method

Consistently with the time period, the area, and the two inverse variables under investigation, the data used are the number of left and right votes at the Greek, municipality level, for the five consecutive, parliamentary election of October 2009, May 2012, June 2012, January 2015, and September 2015.

According to the questions under study, the basic goals are two. The first one, is to find intertemporal localities of left-over-right dominance and vice versa. The second one, is to discover which of the findings of the first goal evolve into a state of inverted dominance, and to approximate the extent of this inversion. Since the first goal is also a sub-goal of the second one, the algorithmic description of the two respective methods takes the following form:

1. Define the weights matrix.
2. Select a statistical-significance threshold.
3. Create an appropriate matrix of false, intertemporal localities of left over right dominance or vice versa for the set of elections under study.
4. Select the right and left parties from the set of parties of each of the five elections under study.
5. Compute the sum of right votes for each electoral period, and each municipality. Do the same for the left.
6. Divide the sum of right vote by the sum of left vote for each municipality, and each electoral period.
7. Also, compute the inverse quantity of the one that step six requires.
8. Find the high-high's of the variable “left-over right vote”. Also, find the high-high's of the variable “right-over-left vote”.
9. Discover the intertemporal localities of left-over-right dominance and vice versa.
10. Based on step 8, discover the intertemporal localities that an inverse state of electoral power replaced.

As observed in the process above, the municipality level was used. A higher level of aggregation such as the regional would probably lead to the discovery of interesting localities. However, these localities would be of questionable credibility, because the regional, and generally all high levels of aggregation are being dealt with skepticism by scientists. A finding of such a level of aggregation might result from processes operating at a lower level. Regarding a lower level than the municipality, it is not always a good choice for the analysis. The most important matter is to ensure that the aggregation level of the analysis matches the level at which spatial processes operate. Nevertheless, a lower level would likely yield intriguing findings.

According to the first step, a weights matrix was selected. One basic characteristic of the chosen matrix is the automatic selection of the fifteen, closest municipalities for every Greek municipality. The number “fifteen” was determined after trying several other numbers, and checking whether each set of neighbors of every municipality contained the set of the municipality's adjacent neighbors. Another
important characteristic of the matrix is that it assumes that the spatial interaction between a pair of municipalities decreases as their distance increases. Also, the spatial interaction between two municipalities does not depend on whether the municipalities belong to mainland Greece, or are islands.

A positive property of the chosen weights matrix is that it allows for the inclusion of islands in the analysis, especially in the case of Greece, where islands constitute a big part of the country. For example, other kinds of matrices do not take islands into account, since they are based on adjacency, meaning that, in order for a municipality to be included in the analysis, the municipality has to touch at least one other municipality.

A negative characteristic of the selected weights matrix is that some municipalities miss one of their adjacent neighbors. This comes from the fact that the missing adjacent neighbor's centroid is at least the fifteenth, farthest centroid. Since the rule selected requires that the fifteen, closest neighbors be chosen, if there are more than two neighbors that have the same distance from the central municipality, and at the same time this distance is the fifteenth, greatest one, then only one can be chosen. That means that the addition of one more neighbor will not necessarily lead to the solution of the problem. Actually, the selection of number “fifteen” resulted from an observed stability in the adjacent neighbors missing, meaning that when the numbers sixteen and seventeen were tested, the adjacent neighbor's number persistently equaled one. It must be noted that there is an informal limit to the number of neighbors that can be chosen, because an extreme amount leads to extreme, non-realistic autocorrelation. A remark about the phenomenon described above, is that it rarely occurs at spatial units that are surrounded by neighbors of similar size and shape. The other helpful scenario is when neighbors have varying sizes and shapes that are uniformly distributed around the central municipality, meaning that every direction around the municipality includes a similar variety of neighbors, regarding the two, geometric criteria mentioned. As the divergence of the surrounding geometry increases from the two, aforementioned scenarios, then the problem intensifies. This means that the proposed method weakens as these geometrical anomalies intensify.

The second step dictates that a statistical significance threshold be selected. The chosen value is 0.01. A value smaller than 0.01 would possibly lead to the rejection of the null hypothesis, for municipalities where it actually holds.14

Step three says that a matrix of false, intertemporal localities of left over right dominance or vice versa must be constructed. The present study refers to the five elections of October 2009, May 2012, June 2012, January 2015, and September 2015, so the matrix takes the form presented as Table 1. Row one contains the elections of the study, presented in a consecutive fashion. The next rows contain consecutive, gray cells, that represent intertemporal localities of a certain beginning and end, their first and last cell, respectively. The longest localities last four elections. Those that last five, consecutive elections are not included, because they would contain September 2015, which is the last electoral period of the study. September is omitted as a possible end, because the second goal of the study requires that the intertemporal localities of goal one, that were inverted, be found. January 2015 is omitted as a possible beginning, because it would only allow for intertemporal localities of a
single, electoral period, which is strange, since the meaning of “intertemporal” implies a period of at least two elections. As regards the use of the matrix, for example, if one has discovered an intertemporal locality of left-over-right dominance, that refers to the elections of June 2012, May 2012, and January 2015, for a certain municipality, and, for the same municipality, one has also discovered a similar locality which only differs in the fact that it refers to May 2012 and January 2015, one should omit the second finding as false, because it is a subset of the first one. It is a two-consecutive-elections locality of dominance included in a three-consecutive-elections locality.

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<th>October 2009</th>
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*Table 1: A matrix of false, intertemporal localities. This table shows subset-superset relationships between localities, so it helps in rejecting subset, or false, localities.*
Step four requires that the parties of right and left ideology be selected for each electoral period. At step five, the sum of right-ideology votes is computed for each municipality, for each of the five electoral periods. The same quantities are computed for left-ideology votes. At the next step, the sum of left votes is divided by the sum of right votes, for each municipality, for each electoral period. Also, the inverse ratio is calculated.

At step eight, the “high-high” localities of left-over-right vote are discovered, and the same is done with the right-over-left vote. In order for such a locality to be a possible part of an intertemporal locality, the ratio must be greater than one in the
central municipality. In that way, the intertemporal localities discovered in the next step, truly express dominance. If this comparison was omitted, a set of consecutive, high-high localities where the respective ratio would be smaller than one, would constitute an intertemporal locality, leading to an entity that disagrees with the goals of the current investigation. It must be reminded that a traditional high-high contains comparisons with mean values, which might be smaller than one.

The first goal is achieved at step nine, where the intertemporal localities of left-over-right-vote dominance and vice versa are discovered using the matrix of false, intertemporal localities of left-over-right dominance or vice versa, and taking into account the definition of an intertemporal locality of dominance. The second goal is achieved at step ten, where the intertemporal units of the former step, which were subsequently inverted, are determined. The present study regards the inversion that happens at the second elections after the final elections that constitute the inverted, intertemporal locality, as valid. Thus, the possible categories of inversion are four, for each of the two, inverse, study variables. The first category includes inversions that happen at the immediate elections after the intertemporal locality, where a high-high appears. The second category differs from the first in the type of local, spatial autocorrelation, which is high-low. In a sense, the second category includes inversions of smaller magnitude, keeping in mind the definition of the four types of local, spatial autocorrelation. The third and fourth category differ from one and two respectively, in that they include inversions that happen in the second elections after the initial state. Categories three and four may represent cases where, compared to the other two cases, inversion happened in a slower fashion.

Results

As far as the question about the existence of intertemporal localities of left-over-right-vote dominance is concerned, seven of them were discovered. Four of these localities begin at the national elections of October 2009, and end at the elections of May 2012. Three of them belong to the same electoral district called “Athens' Second District”, and are called “Kaisarianē”\(^{15}\), “Nea Iōnia”, and “Petroupolē” (category two). The fourth locality belongs to the electoral district called “Peiraiōs' Second District”, and refers to the municipality “Agios Iōannēs – Rentēs”. The remaining three localities only differ in the elections they refer to, which are those of June 2012 and January 2015. Two of these localities belong to the electoral district called “Rodopē”, and refer to the municipalities named “Iasmos”\(^{16}\), and “Marōneia – Sapes” (category one). The last, intertemporal locality of left-over-right dominance belongs to the electoral district “Xanthē”, and refers to the municipality of “Avdēra”.

The intertemporal localities of right-over-left-vote dominance that were found, are twelve instead of seven, of the inverse category. All twelve of them correspond to the elections of October 2009 and May 2012. The electoral district “Rodopē” contains “Komotēnē” (category one) and “Arriana” (category one). The district “Drama” contains “Drama”\(^{17}\), “Doxato”, “Katō Neurokopi” (category one), and “Prosotsanē”. “Evros” contains “Didymoteicho” (category one), “Oresteia”
The second question of the present study seeks the time and space of phenomena of dominance transition from left to right vote and vice versa. Two such cases exist. In both of these cases, a dominant, right, local geography gives way to the left, and the initial, right-dominance state refers to the elections of October 2009, and May 2012. Left-dominance takes place at the second electoral process after May 2012, which is January 2015. The first transition happens at the municipality of “Eordaia”, in the electoral district of “Kozanē”. The final, left-dominance state is a high-low cluster of the rate variable “left-to-right vote”. At May 2012, right vote was 1,4 times greater than left vote, and this inverted to a state where right vote got 0,7 times smaller than left, at January 2015. The other case of right-to-left transition mentioned earlier, takes place at the municipality of “Amyntaio”, in the electoral district of “Phlōrina”. Similarly to “Eordaia”, the final, left-dominance state is a high-low cluster of the rate-variable left-to-right vote. At May 2012, right vote was, again, 1,4 times bigger than left vote, and, at January 2015 0,7 times smaller.

Conclusions

As mentioned in notes referring to the “Results” section, several results belong to some special category. Special categories contain municipalities that are the central, spatial units in some of the results reported above. Such results contribute to the study, but are probably less credible than the rest. The first, special category contains mainland, boundary municipalities, where the boundary may separate Greece from another country, or a mainland municipality from the sea. The boundary does not have to be only a small part of the perimeter of the municipality; it is possible that it almost surrounds it. Since the neighbors of every municipality are necessarily fifteen, a category-one municipality has the same amount of neighbors as the rest, but the bigger the boundary, the shorter the connection with its neighborhood, and thus the greater the number of redundant neighbors. In Illustration 1, a simple example is represented, where a central municipality has only one adjacent neighbor, and three in total. The municipalities are represented as dark, medium, and light gray rectangles that are separated from each other by thin, dark lines. The dark line defines the boundary mentioned above. The parts of the boundary that do not touch any rectangles symbolize that it may continue in any imaginable way. The same goes for the light gray rectangles, which may be more than those drawn. In this illustration, the neighborhood rule requires that the three (instead of the fifteen of the study) nearest, spatial units be selected as neighbors. Thus, the medium gray rectangles constitute the neighborhood of the central, spatial unit (dark gray rectangle), and the light gray rectangles constitute a subset of the irrelevant neighbors. If the neighborhood rule demanded a greater number of neighbors, then it would be very likely that some of the neighbors would be redundant. Category-one municipalities that belong to the study results are “Iasmos”, “Marōneia – Sapes”, “Drama”, (category one), and “Soufli” (category one). “Serres” contains “Serres”18, “Emmanouēl Pappa”, and “Nea Zichnē”. “Arkadia” includes “Notia Kynouria” (category one). “Peiraiōs' First District” includes “Spetses”.


Illustration 1: A simplified example of a central municipality (dark gray rectangle) and its neighborhood. (light gray rectangles) The continuous, dark part of the gray rectangle perimeter represents the boundary, and the dashed line represents the neighborhood perimeter.
The second, special category includes mainland municipalities whose neighborhood, in the context of analysis, misses one adjacent municipality, as Illustration 2 shows. Illustration 2 displays a set of six rectangles. The central municipality, which is depicted by the dark gray rectangle, has five, gray neighbors. This is a result of the neighborhood rule of the specific, hypothetical case, that demands that the five nearest rectangles must constitute the neighborhood. Since the possible neighbors are six, one of them, the farthest one, must be dismissed. In Illustration 2, the dark rectangle is omitted. However, this exclusion happens to be an adjacent rectangle, which, as regards the variable of the present study, which is a vote ratio, definitely affects the vote ratio of the central municipality, and vice versa. This means that the interaction between the dark and the dark gray rectangle is ignored, which is bizarre.
Illustration 2: A simplified example of a central municipality (dark gray rectangle) and its neighborhood. (light gray rectangles) The black rectangle should be a part of the neighborhood. However, since its centroid is
So, the first-category municipalities have more neighbors than necessary and the second-category municipalities have one less than necessary. The second category includes “Kaisarianē” and “Petroupolē”.

Regarding a result that belongs to category one or two, its credibility drops to an extent, because the defined neighborhood and the actual one diverge. An unnecessary neighbor of a category-one municipality, which, by definition of this category, is one of the remotest, increases the respective, spatial lag, when this neighbor has a value that is above average. The same, remote neighbor decreases the spatial lag when the value is below average. Nevertheless, since the spatial lag's weights reduce linearly as the distance of the neighbor and the central municipality increases, and given the fact that this neighbor is a remote one, the difference of the study, spatial lag, and the actual, spatial lag may be small. As a result, the local, spatial autocorrelation category probably remains the same, and the same goes with the end-product of question one, the intertemporal localities of left-over-right-vote dominance and vice versa. Thus, it is fair enough to assume that when the redundant neighbor is just one, it does not matter. However, the former assumption implies that when the redundant neighbors' number increases, the credibility of the result probably drops significantly. Such municipalities do not exist in the results of the present study.

Category-two results are less credible than those of category one, since the omission of an adjacent neighbor in electoral studies is always bizarre. An adjacent neighbor, is falsely represented by his centroid in the analysis, since such a
representation ignores the fact that this kind of neighbor touches the central one, and therefore affects it significantly.

It is crucial to emphasize that the set of neighbors that corresponds to each municipality cannot be changed, because the rule by which the neighbors are defined in a particular study area must be just one. Thus, the former analysis about the credibility of the results does not lead to neighborhood changes. Its purpose is to provide a sense about the results' credibility and suggest a direction towards the assessment of such results.

The results of goal one that do not belong to any special category are “Nea Iōnia”, “Agios Iōannēs – Rentēs”, “Avdēra”, “Doxato”, “Prosotsanē”, “Serres”, “Emmanouēl Pappa”, and “Nea Zichnē”.

As far as the other type of results is concerned, which are localities of dominance of right-over-left vote that were inverted, none of them belong to any special category. These two localities are centered around the municipalities “Amyntaio” and “Eordaia”. In both cases, the geographical, power regime was not completely inverted, since the final status is a high-low of the inverse variable “right-divided-by-left”, and not a high-high. Furthermore, both of these inversions happened in a relatively slow way, since they appear at the second elections after the end of the initial, right-over-left-dominance state.

As regards all of the results, it should be reminded that they have the property of statistical significance, which means that first and second order effects operate between each central municipality and its neighbors, creating a coherent and interactive locality. With respect to the intertemporal localities found, it should be noted that all of them last two elections, which is the smallest possible duration in the defined time period of five, consecutive elections. A suitable speculation could be that this is a manifestation of the frequently mentioned instability of the Greek electorate. This is also slightly supported by the fact that the localities that were found, were very few. On the other hand, it could be said that the opposite is shown by the fact that only two out of a total of 326 municipalities were found to be the center of an inverted, spatial, vote regime. However, a possible explanation is that the criteria defined for the discovery of such inversions are very strict. A last, general comment on the results obtained, is that no inversions of left to right were found. A possible explanation is that left voters are geographically more stable than right voters. However, it is important to restate that the present study's time-period is the period of Greek austerity. As a result of that, any speculations mentioned in the present section of “Conclusions” refer to this period only. In addition, it is highly probable that the extreme characteristics of Greek austerity contribute to any geographical instability of the Greek electorate.

It should be clarified that the results of the first goal are not regions where the left or the right is powerful. The results are about the power of the one relative to the other. The latter does not necessarily lead to the former, since there are more points in the electoral, political spectrum, such as the center, the far-right, and others. Additionally, the aforementioned regions may contain municipalities where the relative power of left and right at the central municipality is not maintained. Another appropriate clarification is that an intertemporal locality of left-over-right dominance
or vice versa is not a set of municipalities where the left vote is greater than the right vote or vice versa, in each municipality, for the time period under study. Dominance, as used in the present study refers to three facts. The first one is the absolute dominance of the left over the right vote or vice versa at the central municipality, and the relative dominance as well, meaning that the left-to-right or the inverse quotient surpasses the national, mean value. It should be noted that absolute dominance does not lead to relative dominance, and vice versa, nor does the one exclude the other. The second fact is the relative dominance of the variable under study in the central municipality's neighborhood as a whole. Actually, as mentioned in the “Background” section, this kind of dominance is not a traditional, mean value, but a spatially weighted one. The third, most important fact is that the two former facts happen close to each other in a non-random way, as the presence of statistical significance shows. The third fact is the main reason that such a result should be a matter of interest, and merits an attempt for explanation by political scientists, electoral geographers, and others.

Concerning the replicability of the results produced, it is crucial to mention that the method used has a stochastic nature. This is due to the fact that ceteris paribus, meaning that the same significance level and weights matrix are used, the repetition of the method may lead to slightly different results. In particular, a locality rendered as high-high in one instance may not be included in the results in another one, since the statistical significance computed may exceed the specified threshold in the second case.

Apropos of the method that is proposed, it can solve similar problems to the one posed in the current investigation. The variable used does not have to be an ideological one. For example, it could be the quotient of the two most powerful parties of Greece. In this instance, the results produced could probably show to the respective, political parties some regions where they are weak, compared to the rival party, and thus, the parties could attempt to analyze these regions, or shape their electoral campaigns accordingly, in order to increase their power in these localities. If the method's matrix is changed, then the method can be applied to other countries or parts of countries in order to illuminate the respective elections' dynamics.

A positive aspect of the method is that it excludes all problematic, spatiotemporal techniques and indices, using spatial counterparts which are combined, leading to a spatiotemporal method without spatiotemporal elements. A negative characteristic of the method is that the more the municipalities that belong to special categories one and two are, the weaker the method becomes. Another possible weakness of the method is that it might be sensitive to localities whose center is a municipality that belongs to category one. This worry is expressed due to the fact that fifty-two percent of the results given, which is over half of them, belong to category one. Nevertheless, this observation might not result from a method problem, but from the possible fact that many intertemporal localities of right-over-left dominance are positioned at Greece's borders. Such a fact would not be strange since borderline regions receive a great number of immigrants for a couple of decades at least, which might increase and preserve a relatively powerful right, given the fact that the right expresses fear of immigrants more than the left, since the right, in the present paper, includes some
parties that tend to far-right. It should be mentioned that the observation described is not a manifestation of the so-called “edge effects”, since the latter is a phenomenon where problems arise from a boundary that leaves relevant, spatial units out of the study area. National boundaries do not belong to this case, when the variable under study are national elections.

An important property of the method is the spatial unit of reference. Specifically, in the present study, the level of municipality has been chosen. Hypothetically, the method could be applied to greater levels as well, such as the regional level. Howbeit, such an attempt requires caution according to bibliography. It is probably more interesting and reasonable to apply the method in a lower level than the municipality.

Future work could check the evolution of the two, found localities of inversion, centered at “Kaisarianē” and “Petroupolē”. A question of this kind is whether the inversions will be completed or return to the initial state. A methodological change that could be investigated is using the variable “austerity-parties, total vote” divided by the anti-austerity counterpart, instead of left-divided-by-right vote and vice versa. Both variables refer to dichotomies which heavily influence Greek politics.

Notes

2. The two assignments were completed by students of the graduate program “Environment and Development” of the National, Technical University of Athens.
3. For all steps of the proposed methods, see “Method” section.
5. In the present study, the set of spatial unities is the set of the Greek municipalities.
6. A variable that is distributed in space, is called “spatial”.
7. The notion of a weight is explained in following paragraphs.
11. Longley et al., Geographic Information Systems, 88.
12. Longley et al., Geographic Information Systems, 100.
15. This municipality belongs to category two. See the “Conclusions” chapter for details about
the characteristics of this category of municipalities.
16. This municipality belongs to category one. See the “Conclusions” chapter for details about the characteristics of this category of municipalities.
17. The district "Drama" contains a municipality with the same name.
18. The district "Serres" contains a municipality with the same name.
19. For further explanation see: Luc Anselin, “Local Spatial Autocorrelation” Filmed October 2016 at the University of Chicago, Chicago, IL. Video, 19:57.