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CONDOMINIUM CO-OWNERS AND THEIR TYPOLOGY BASED ON THEIR ENGAGEMENT IN THE PROCESS OF DECISION-MAKING

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Abstract

In our study, we referred to a large and growing body of literature on voter turnout and voting habits. A careful examination of the voting issue in the context of housing prompted us to assume that a simple division into two groups of voting habits, namely voting and non-voting, may not be sufficient to explore complex relations during the voting process in condominiums. Thus the study addresses the question of whether we can identify more than two homogenous clusters of condominium co-owners, taking into consideration their voting habits.

The analysis presented in this paper comprises two stages. First, data relating to condominium co-owner characteristics are forwarded and cluster analysis is used to form subsets of voters. Second, the impact of selected methods of voting on the propensity to vote is assessed using the identified clusters. The applied research strategy led us to distinguish four groups of condominium co-owners: engaged, non-voters, promising and dormant voters.

The article contributes to a better understanding of the process of making decisions in condominiums with a focus on voting habits. In particular, we indicated that studies on voting habits provide a solid foundation for more-context dependent studies on the voting process and suggest other areas to study voting habits.

Keywords: *housing, condominium, voting habits, decision making, e-voting, cluster analysis*.

JEL Classification: *D01, L85*.

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1. Introduction

In most European countries, the purchaser of an apartment acquires individual ownership of this apartment, together with co-ownership (joint ownership) of the common areas of the building, and becomes a member of the co-owners' association. Membership of the co-owners' association entitles each co-owner to participate in the process of collective decision-making (Crettez & Deloche, 2019).

Generally, the decisions on the functioning of the common property are made jointly by members of the co-owners' association (owners of individual units). To guarantee that the owners' association can reach necessary decisions, it is crucial that decisions on everyday management and other important matters be secured. Therefore, in most countries, the owners' association elects an executive

board, whose responsibility, together with the managing agent, is to maintain order in the common areas or, in a broader sense, to take part in the property value co-creation (Węgrzyn & Najbar, 2020). The basic range of responsibilities is usually enumerated and provided by law regulations or statutory documents and does not require a special procedure to be taken. As a rule, however, several actions (e.g. concerning financial issues) require a resolution by an appropriate number of owners of the premises.

In Poland, this process is regulated by the provisions of the Act on the ownership of premises. Legislative regulations impose an obligation on co-owners to jointly decide on the following resolutions: approval/rejection of the annual financial plan, setting the management fee rates, or an agreement on any changes concerning the intended use of the common property.

All these resolutions are adopted by the majority of votes. The majority rule relates to the sum of shares (referring to the size of a premises) of all co-owners in a given condominium. Valid approval of a resolution takes place when the majority of co-owners (represented by their shares) vote for a given resolution. There are no obstacles to collecting the votes at the annual meeting of condominium co-owners or individually. In practice, collecting individual ballots is done by posting letters (traditional way) or online voting.

In general, the outlined procedure seems to ensure that the decision-making process in condominiums is efficiently conducted. However, in the light of practical experience, several important issues were missed. For example, legal rules do not specify the duration of voting in a condominium. Thus, in practice, it takes a long time to decide on a given resolution. Sometimes - due to the negligence in voting - relevant decisions may remain unadopted, which prevents further action. This may cause a delay or even cancellation of implementing the assumed budget or investment plans. In extreme cases, the lack of decisiveness among co-owners forces the managing agent to involve the court in decision-making to take necessary action.

The engagement of the court in the process of decision-making is a measure of last resort. However, a kind of paradox emerges from the above. The legal regulations are aimed at introducing an effective voting process, ensuring the protection of interests of a possibly large group of co-owners. That aim would be achieved only if at least half of the co-owners were engaged in the decision-making processes in their condominium. Unfortunately, this turns out to be a kind of postulate rather than a fact. It is plausible to assume that, in each condominium association, there is a group co-owners who indeed demonstrate a responsible attitude toward their duties. Nevertheless, a high number of co-owners resign from their rights and prefer not to take part in the voting process, assuming the decision will be made even without their engagement[1].

In practice, managing agents try to use a variety of techniques and tools to improve the voting process (e.g. voting via the internet, sending reminders, phone calls). However, it is sometimes difficult to determine the effectiveness of these activities. Additionally, we assume that different target groups of co-owners may be responsive to various measures.

In light of the above, the effort made to get insight into condominium co-owners' habits may lead to a better match of voter types and incentives that could be implemented to facilitate the voting process. That is why the research seeks to examine what kind of voters could be distinguished in condominiums and what are their main characteristics.

The remainder of this study is as follows: the next section presents the literature review on voting and voting habits, followed by a methodological part with an outline of the method used. Finally, the primary analysis is undertaken to explore voting patterns in a given condominium and to find the similarities and differences between the defined groups. The article ends with conclusions and suggestions for further research.

2. Literature review

The literature review is divided into two parts. First, we refer to a large and growing body of

[1]Similar observations were reported by K. Suszyńska (2005) in her work concerning tenant participation in social housing stock (TBS and municipal) management. In order to identify the level of social participation, the Author described the tenants' activity in a number of social issues (e.g. social functions they hold, participation in elections, meetings, social campaigns, activity on Internet forums). The research results brought the Author to the conclusion that broadly defined activity of people (living in TBS and municipal apartments) can be described as moderate or low.

literature on voter turnout and voting habits. Second, we direct our literature review to the housing literature to grasp the social context of the engagement of the owners in the process of real estate management.

The analysis of the voting process gives us an insight into the instrumental side of conducting research. We focus particularly on voter turnout as the subject of research and the methods of studying the voting process. One of the first works on voting was the publication of Buchanan and Tullock (1962) on the structure of political voting organizations. The foundation for this concept is embedded in the assumption of maximizing one's benefits. The theory focuses on the choice of the optimal voting rule as a function of the characteristics of a decision-making group, and of the type of decision to be made[2].

The corporate voting literature, initiated by Manne (1964), focuses primarily on two issues: the assignment of votes in relation to income claims within a corporation, and the selection of the voting percentage required to transfer control of a corporation.

Equally, voting can be treated as an act of political or social participation. As such, one of the fundamental issues is the problem of turnout. The literature seeking to understand this phenomenon is well established (Aldrich et al., 2011). The traditional models of why people vote are conceptualized as a static, self-interested decision. In this context the reduced voters' incentives to vote may be explained by diffused ownership that can create free-rider problems and lower the likelihood that a particular vote is pivotal in a voting process (Bethel & Gillan, 2002). That contributes to an increase in voting costs that are then divided among all co-owners[3].

This approach, however, cannot explain why people vote given a minimal probability that their vote will affect the outcome of the voting. The problem started to be called a paradox or, more euphemistically, a puzzling implication of the rational choice theory of voting (Bendor et al., 2003). It is, however, not uncommon when particular problems evaded by one theory boost the other one. This happened in the area of voting theory, and the question of turnout has become a core subject of interest among behaviourists (Rogers et al., 2013). Their research helps identify several additional, currently under-appreciated factors that may affect people's likelihood of voting. In a recent study, Rogers et al. (2013) provided a comprehensive review of experiments in this field and added three crucial observations to the issue of voting behavior. First, voting is influenced by actions occurring before and after the moment of voting. Second, voting is not a purely self-interested act, but an inherently social activity that may accrue not only instrumental and consumption benefits but also fulfill basic needs of affiliation and belonging to a larger group. Third, voting is an expression of one's identity (Rogers et al., 2013). Additionally, turnout, like any other response, becomes automated through behavioral repetition. When people abstain from voting, their subsequent tendency to vote declines; when they vote, they become more likely to vote again (Gerber et al., 2003).

However, to the best of our knowledge, little is known about voting behaviors in the area of housing literature[4]. It seems that the issue of voting tends to be underestimated even though multifamily housing serves a vital role in the real estate marketplace, and membership in this type of association entitles each co-owner to participate in the process of collective decision-making.

Despite this, we can indicate several examples of comprehensive and worthwhile research works concerning the issue of voting in condominiums

[2]Despite the passage of time, the theory is still popular among scholars who advance it in new directions. For example, they demonstrate that voting can still be rational if individuals have "social" preferences and are concerned about social welfare (Edlinet al., 2007).

[3] The selected method of voting in organizations affects two types of costs (1) the wealth transfer costs and (2) the decision-making costs associated with voting. According to Barzel and Sass (1990) the wealth transfer costs in condominiums may occur when votes are proportional to the value of units but assessments are uniform, owners of more valuable units could exploit the voting process to reap gains at the expense of owners of smaller units. The vote allocation method will also affect the costs of decision-making within a voting organization, one of which is simply counting votes.

[4] In a broad sense, housing literature deals with the issue of mapping the structure of social relations of housing provision (Ruonavaara, 2018). Those observations find its expression in a literature study on multifamily housing by Zietz (2003). In her comprehensive review, Zietz categorizes topics related to the environment and performance of multifamily housing into five groups: economic and market efficiency issues; property valuation and appraisal issues; regulatory, zoning and clustering of multifamily complexes; costs, returns and rental income issues; and demand, vacancy and occupancy issues.

An essential reference to the problem of voting in housing condominiums can be found in Barzel and Sass, (1990). The authors develop a general theory of the allocation of resources by voting and then focus their analysis on owners' associations for newly developed condominiums. The work is based on a general assumption supported by public choice literature that voting optimization implies minimizing the costs associated with voting. They indicate three major organizational tools that affect costs associated with voting. The first is the choice of ownership rights that buyers receive with the asset. The second is the rules under which decisions are made. Another method by which the costs of a voting organization can be affected is through control of issues that will be subject to vote.

More recently, Ben-Shahar and Sulganik (2005) turned to the problem of the heterogeneity of condominium co-owners and its implications for setting the optimal rule of voting. Their results imply that, for any given voting rule, there will be a set of potential consumers with distinct characteristics who will consider that rule to be optimal. The link between voting rule and cost-sharing was also examined, for example, by Lujanen (2009), and Crettez and Deloche (2019).

Another approach to the problem of voting deals with the issue of the social involvement of owners (and tenants) in the process of property management. For example, Winter (1990), in his case study on the link between homeownership and political activism, shows homeowners to be more active in community-based political activism than renters. This research thread has been also explored by Suszyńska (2015). In her research, she presents the concept and significance of the involvement of tenants in the processes of managing social housing.

The literature study shows that the issue of voting combines numerous economic threads and provides a wide field for further research. A common thread running through these contributions is that the decision environment can influence the voting process[5]. Given all that has been mentioned so far, a wide range of factors influencing voting behaviors and voting turnout can be identified. These factors can be analyzed from different perspectives, based on classical as well as behavioral economics. However, far too little attention has been paid to the issue in the area of housing literature.

3. Data and Methods

In general, we can distinguish two types of voters: those who participate in the voting process and those who avoid doing it. However, regarding the research problem, this interpretation may not be sufficient from the perspective of a voting theory as well as practice. In the political election, the main question - apart from the problem of choosing the best candidate - is whether to vote or not to vote. The voting process in housing condominiums departs from that scheme because co-owners resolve a different set of problems. These are not only whether to vote, but also when to vote and how to vote.

That is why we address the question of whether we can identify more than two relatively homogenous clusters of condominium co-owners when taking into consideration their voting habits.

However, empirical research on voting habits in the housing context is often hindered by the lack of specific and reliable data. We handled this problem with the help of a property manager who provided us with the necessary data on the voting results from a selected condominium. The research is based on the data gathered for the mixed-use condominium association located in Cracow, Poland (hereinafter: Condominium X). The facility was built in 2013 and comprises 123 apartments and three commercial premises. The data covers the results of voting for the 2016 - 2019 period. The data set also includes information on the physical features of the facility, essential single voter characteristics such as the share in the condominium or the place of residence.

Our research strategy approach is twofold: to find whether we can identify specific voting habits and to examine factors that characterize the defined groups. To do this, we follow a two-step procedure. First, we use the partition cluster method to find groups of similar voting habits. In the second step, we follow log-linear analysis to find whether the revealed patterns of voters' habits can be associated with some characteristics of the condominium co-owners, methods of voting, or the actions of a property manager.

To discover the patterns of voting, we use cluster analysis. Cluster analysis embraces various

[5]For example Thaler, Sunstein, and Balz (2013) analyze a range of the tools that are available to "choice architects" who can shape the decision environment. The authors show how the choice architecture can be used to help people make better choices without forcing the intended outcomes upon anyone. The growing popularity of the behavioural approach has resulted in the emergence of various public interventions that affect the most common cognitive errors[5] (Olejniczak & Śliwowski, 2014).

scientific disciplines: from biology and genetics to statistics and marketing research. It has also found application in the area of real estate studies, e.g. (O'Roarty et al., 1998), (Głuszak & Marona, 2011), (Małkowska & Uhruska, 2019).

The objective of cluster analysis is to form categories of entities and assign individuals to the proper groups within them (Punj & Stewart, 1983). In general, we can distinguish two types of cluster analysis: hierarchical and partitioning methods. Hierarchical clustering algorithms recursively find nested clusters either in agglomerative (bottom-up) mode or in divisive (top-down) mode.

In turn, partition methods of clustering divide observations into a separate number of non-overlapping groups. They require a decision to be made, a priori, regarding the number of clusters (k) that are created by using an iterative process. The most popular partition methods are k-means and k-medians. The main reasons for their popularity are the ease of implementation, simplicity, efficiency, and empirical success (Jain, 2010). Salem, Naouali, and Sallami (2017) confirm that this method can also be used to analyze categorical data.

The main method used in the second step is log-linear modeling. Log-linear analysis has become a widely used method for the analysis of multivariate frequency tables. Log-linear analysis is performed for the cell counts in tables. The goodness of a postulated log-linear model can be assessed by comparing the observed frequencies with the estimated expected frequencies. For this purpose, usually, two chi-square statistics are used: the likelihood ratio statistic and the Pearson statistic (Vermunt, 1996). The log-linear analysis can be used to describe association patterns among a set of categorical variables. To analyze associations and interactions, all variables have the same status and are not classified as dependent or independent (Agresti, 2007).

Finally, we consulted the obtained results with the property manager with a view of her expertise in property management and anticipation refining our conclusions.

4. Empirical results

4.1. Exploring voting habits: cluster analysis

The research has an explorative nature. In the beginning, we address the question of whether we can identify any patterns of voting habits in condominiums. Then we turn to the problem of identifying co-owners characteristics that are associated with the defined voting behaviors. We start, however, by describing the voting process in Condominium X during the 2016-2019 period.

At each annual meeting, co-owners discuss obligatory resolutions (resulting from the provisions of the Act on the ownership of premises, i.e., approval of the community's annual financial statements for the previous year, adopting the financial budget for the current year, the discharge of the condominium management board, approval of advances for the management costs of common property and its renovation) and facultative resolutions that can be introduced by a co-owner or a property manager. These facultative resolutions usually concern activities of a non-routine nature. The detailed information on the resolution types was presented in the table below (see Table 1). Further information on the voting process covers the following set of data: available voting options, date of the co-owners annual meeting, number of attendees during the meeting (in of the shares represented at the meeting (%), number of all resolutions in the schedule

Considering the available voting options, the co-owners of Condominium X can vote at the annual general meeting of members of the condominium association (co-owners meeting) or by posting the ballot (letter). In 2019, the possibility of Internet voting was introduced (via e-mail or a dedicated online platform).

Table 1

Summary of the voting process in Condominium X in 2016-2019

	2016	2017	2018	2019
Details on the co-owners annual meeting				
Resolutions types	4 obligatory and 1 related to the election of members of the executive board	4 obligatory and 4 related to debt collection and charging interest rates	4 obligatory and 4 related to e-voting, consent to incur additional costs of renovation and investment works	4 obligatory and 2 approving the performance of investment works

No. of all resolutions in the schedule	5	8	8	6
Available voting options	(1) co-owners meeting, (2) letter	(1) co-owners meeting, (2) letter	(1) co-owners meeting, (2) letter	(1) co-owners meeting, (2) letter, (3) internet
Date of co-owners annual meeting	29.02.2016	22.03.2017	28.03.2018	27.03.2019
No of attendees	21	16	10	10
% of shares at the meeting	36.03	32.33	8.40	7.86
Details on the analyzed resolution: approval/rejection of annual financial statements for the previous year				
Date of approving the resolution	05.09.2016	18.09.2017	02.10.2018	07.12.2019
Time span of voting (days)	189	180	188	255

Source: own study.

Table 1 shows that the number of co-owners participating in the annual meetings is relatively small. Usually, it is not possible to obtain a minimum number of 50% of votes (represented by shares) required by law to proceed with a resolution. That is why other forms of collecting votes are needed.

In our research, we will focus on a selected resolution, namely the decision on approval/rejection of annual financial statements for the previous year (data on the course of voting on this resolution are presented in Table 1 in the last two lines). We choose this particular resolution because of its objective nature. The co-owner does not have to consider how the outcome of the voting will influence the future cost of property management because the resolution refers to the expenses that have already been incurred. That is why co-owners hardly ever decide to vote against the resolution. We analyze the outcome of the voting process on that resolution regarding the literature on voting habits.

According to Gerber et al. (2003), the concept of habit implies that, if two people whose psychological propensities to vote are identical should happen to make different choices about whether to vote, these behaviors will alter their likelihood of voting in the next election. In other words, holding preexisting individual and environmental attributes constant, merely voting increases one's chance of returning. However, in our study, each co-owner has more than two options to choose from. First, she or he can pass the vote at the co-owner meeting that is called each year, second – voting by the traditional mail, third – e-voting (since 2019), and finally, she or he may decide not to vote.

Given the above, the voting patterns were analyzed based on categorical variables describing the form of passing the vote by a given co-owner. Concerning the form of passing the vote, the variables for 2016, 2017, and 2018 include three categories and, for the year 2019, - four categories.

To explore the data set, we used k-means analysis. We used three different approaches to initialize centroids: (1) maximizing distance between clusters, (2) random starting points, and (3) k-first observations. The number of clusters ranged from 2 to 7. A common method of initiating centroids is to maximize the distance between clusters. For this approach, we obtained the optimal number of 7 clusters (error in the learning sample 0.519) confirmed by K-fold cross-validation. The remaining two approaches revealed only two main clusters in the data set. An in-depth analysis of the obtained results, together with all available data on the voting process in the examined condominium, leads us to the conclusion that these initially revealed clusters do not offer a satisfactory basis to build upon when interpreting the data. Of course, if we look at voting as a self-reinforcing act, we can indicate two groups of co-owners, namely voters and non-voters. The key insight, however, is that a change in voting behaviors may occur after any randomized intervention (Gerber et al., 2003). In our case, we identified two important factors that significantly influenced the voting process in Condominium X. In 2016, the co-owners decided to elect the advisory board and, according to the property manager, the issue was comprehensively discussed at the co-owners meeting. Secondly, e-voting was implemented in 2019. That is why we found 4 cluster solutions to be interpretable (see Table 2). These clusters were revealed by fitting centroids as 4-first observations (error in the learning sample, 0.7566).

Table 2

The types of clusters
(centroids initialized by the 4-first observations, error in the learning sample, 0.7566)

Clusters	Categorical variables				No	%
	16_v_type	17_v_type	18_v_type	19_vo_type		
1	s_meet	s_meet	s_meet	s_meet	16	12.60
2	no	no	no	no	73	57.94
3	letter	letter	letter	e-voting	29	23.01
4	s_meet	no	no	no	8	6.35

Source: own study.

Detailed frequency data in the defined clusters are presented in the following table (Table 3).

Table 3

The frequency table for the categorical variables

	Cluster 1 Engaged	Cluster 2 Non-voters	Cluster 3 Promising	Cluster 4 Dormant	Total
2016					
letter	4	10	22	0	36
no	1	63	5	0	69
s_meet	11	0	2	8	21
2017					
letter	3	12	22	1	38
no	0	60	5	7	72
s_meet	13	1	2	0	16
2018					
letter	9	16	27	1	53
no	0	56	0	7	63
s_meet	7	1	2	0	10
2019					
e-vote	2	12	16	2	32
letter	4	8	13	0	25
no	2	52	0	5	59
s_meet	8	1	0	1	10

Source: own study.

Results obtained from the k-means analysis were then supplemented by another set of data concerning additional aspects of the voting process in Condominium X, e.g. the frequency of the annual meeting, the rate of passing the vote, number of reminders sent by the managing agent (see Table 4). That allowed to investigate the process of voting in the condominium considering the four identified clusters.

Table 4

Characteristics of co-owners voting groups

	Clusters of voters				**Total**
	1	2	3	4	
Cluster size	16	73	29	8	**126**
Total share in %	32.57	43.00	19.07	5.36	**100.0**
No. of those living in Cracow	11	40	8	5	**64**
No. of those living in another city	5	33	21	3	**62**
No. of occupants	6	18	4	3	**31**

No. of non-occupants	10	55	25	5	**95**
2016					
The rate of attendance	0.69	0.00	0.07	1.00	**0.17**
The rate of votes	0.94	0.14	0.83	1.00	**0.45**
Av. time for vote (days)	50.19	280.75	127.79	0.00	**198.44**
Av. no of reminders	0.81	2.93	2.28	0.00	**2.33**
2017					
The rate of attendance	0.81	0.01	0.07	0.00	**0.13**
The rate of votes	1.00	0.18	0.83	0.13	**0.43**
Av. time for vote (days)	6.50	245.99	95.10	251.88	**181.22**
Av. no of reminders	0.06	2.68	1.24	2.63	**2.02**
2018					
The rate of attendance	0.44	0.01	0.07	0.00	**0.08**
The rate of votes	0.94	0.12	0.93	0.13	**0.41**
Av. time for vote (days)	35.69	232.97	72.00	251.75	**172.06**
Av. no of reminders	0.63	3.48	1.31	3.75	**2.63**
2019					
The rate of attendance	0.50	0.01	0.00	0.13	**0.08**
The rate of votes	0.88	0.29	1.00	0.38	**0.53**
Av. time for vote (days)	45.75	231.66	53.14	184.00	**163.94**
Av. no of reminders	1.38	5.99	1.76	4.75	**4.35**
The rate of e-voting	0.13	0.16	0.55	0.25	**0.25**

Source: own study.

The obtained results support an intuitive point of view on the functioning of Condominium X. The four clusters reflect the following voting habits:

Cluster 1 (engaged voters), which is represented by co-owners and corresponds to a group of 12.6% shares in the common property. The representatives of this segment vote mostly at co-owners meetings and, according to the opinion of the managing agent, they show a particular interest in condominium affairs.

Cluster 2 (non-voters), which represented the biggest group of all clusters (size: 73 co-owners), accounts for 43% of the total share. In general, this group does not take part in the members' meetings at all. They also react reluctantly to any incentives to vote. That is why we decided to define this group as non-voters.

Cluster 3 (promising voters) represents 29 voters (total share of 19.07%). The representatives of the cluster are not interested in participating in annual co-owners' meetings. However, the voters were interested in voting by letter in 2016-2018. The possibility of electronic voting introduced in 2019 made it the most active group of voters in that year. The results obtained in 2019 present that these voters have changed their voting habits to the greatest extent. That is why we decided to define the representatives of the cluster as promising voters.

Cluster 4 (dormant voters) is the smallest group of voters - represented by eight voters. This group was still the second-largest group of owners attending the meeting in 2016, however, they ceased (in most cases) to vote in the following years. We assume that their behavior is motivated by the types of issues that were discussed at the general meeting. In 2016, co-owners voted on the election of members of the executive board. That was the reason for an increased rate of participation at the meeting. These co-owners, engaged in the voting process in 2019 (via e-voting) to a small extent (merely 25% of its members). The gathered data indicates that they reveal an interest in the issues of the condominium only in particular cases, that is why we decided to define this cluster as dormant voters.

The result of the first stage of the analysis is the identification of four clusters according to voting habits. The second stage of the research focuses on identifying the characteristics of co-owners that are associated with the defined voting behaviors. The main method used in this step is log-linear

modeling, and the results have been presented in Table 5.

Table 5

Tests for marginal and partial associations

Effect	*df*	Partial association		Marginal association	
		Chi-square	*p-value*	*Chi-square*	*p-value*
1*	3	61.84431	0.000000		
2**	2	43.90534	0.000000		
3***	1	0.02662	0.870398		
4****	1	28.20216	0.000000		
1-2	**6**	**11.01619**	**0.087877**	**12.99693**	**0.043085**
1-3	3	5.01190	0.170928	7.48450	0.057958
1-4	3	0.77926	0.854420	4.33377	0.227606
2-3	2	2.85996	0.239314	1.49022	0.474682
2-4	**2**	**6.96973**	**0.030658**	**6.68190**	**0.035403**
3-4	**1**	**32.58465**	**0.000000**	**32.78879**	**0.000000**
1-2-3	6	1.34502	0.969118	2.35420	0.884415
1-2-4	6	3.80641	0.702856	3.77898	0.706556
1-3-4	3	1.77687	0.619981	1.75517	0.624740
2-3-4	2	1.12574	0.569572	1.16321	0.559001
*1- voter type (engaged voter, promising voter, dormant voter, no-voter), **2-share class (small, medium, big), ***3 – city (Cracow, other), ****4- purpose (user, investor)					

Source: own study.

It is apparent from this table that the best-fitted model is the model with two-level interaction between 1-2, 2-4, and 3-4 factors, with 21.370 chi-square value at the p-level of 0.9018. Chi-square tests are not statistically significant; that is why we can assume that the chosen model explains the data in a plausible way. The model indicates that the residents of Condominium X live in Cracow (effect 3-4), which is rather logical. Two other types of associations seem to be more interesting. Those co-owners who live in the condominium occupy larger apartments than those who declared another place of living (effect 2-4). This is in alignment with the market observation that smaller apartments are perceived as an attractive investment option that provides stable financial revenues from renting[6]. Finally, we can indicate that the engaged voters are more likely to have a larger share in condominium co-ownership (effect 1-2).

To graphically present the associations between the analyzed factors, we used correspondence analysis (Figure 1).

Regarding the size of the share and the propensity to vote, our results seem to be consistent with the classical assumption that voters are motivated by the outcome, which is a function of the costs and benefits of voting (Bendoret al., 2003). Thus co-owners representing larger shares are more motivated to participate in the voting process. However, there are other possible explanations. It seems plausible that the property manager may choose to contact the co-owners possessing a higher share to speed up the process of collecting votes. In our case, we obtained the reports on the number of reminders that were sent to the co-owners (see Table 4, the average number of reminders), and the property manager confirmed that the chosen method was sufficiently effective to advance the process of collecting votes. The obtained results therefore need to be interpreted with caution.

While trying to explore other co-owners' characteristics that describe defined clusters, we also investigated how long it took to decide to vote or not. For that purpose, variance analysis was conducted. We analyzed the data according to the defined groups and the mode of voting (see Figure 2).

[6] For example, M. Tomal (2020) indicates that floor area has a negative impact on rent per 1 m2 in almost the entire analyzed area in Krakow, which is to be expected. We can thus expect that investing in small apartments may be more attractive from the perspective of the rate of return.

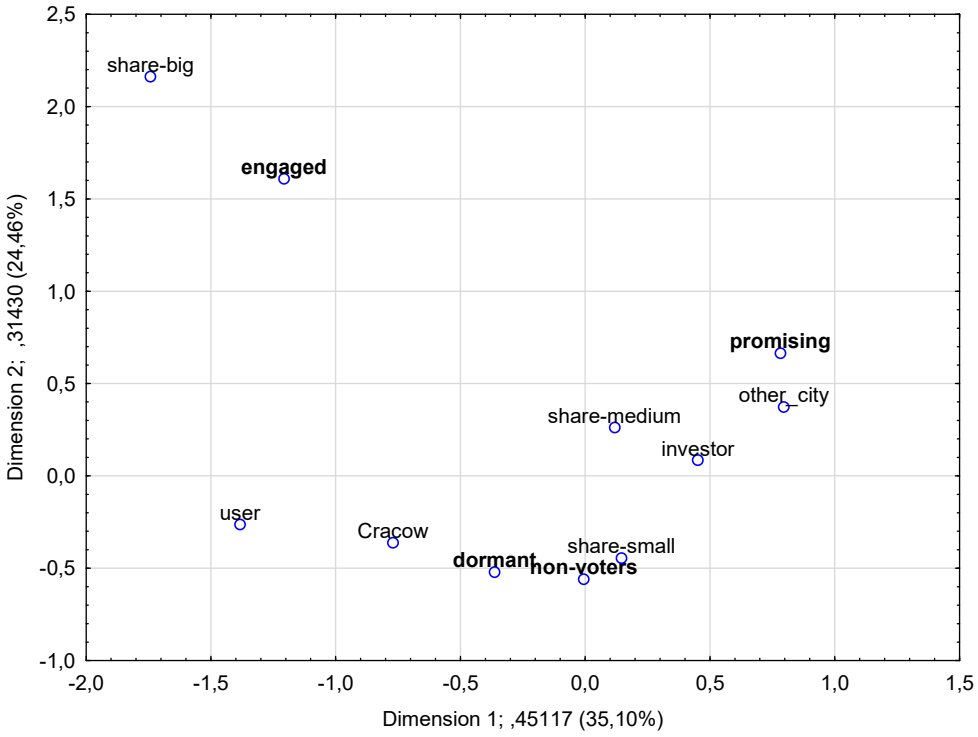


Fig. 1. Correspondence analysis map *Source*: own study.

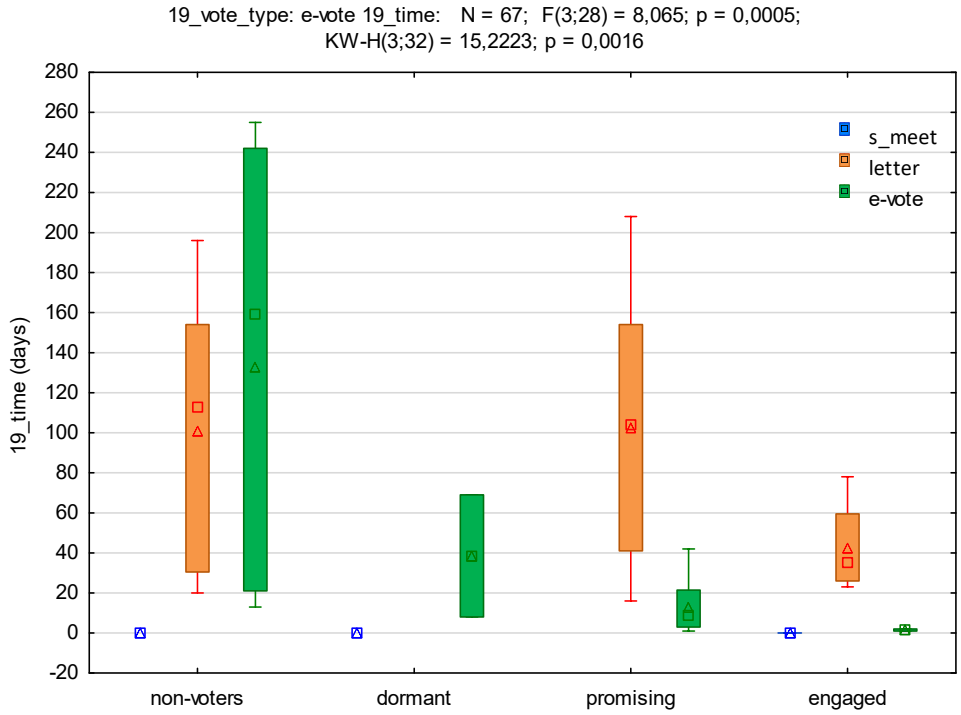


Fig. 2. Analysis map of the variance analysis of the average time needed to pass the vote correspondence. *Source*: own study.

As shown in Figure 2, the engaged and promising voters were the fastest in on-line voting. The promising group is also characterized by the most significant share of co-owners who choose the form of e-voting (see Table 3). The issue of investigating the relation between e-voting and turnout was beyond the scope of our research. Nevertheless, the results confirm that different voter groups may reveal different attitudes toward e-voting.

Overall, the conducted research provides important insights into the process of voting in condominiums. We were able to identify more than two groups of voters and to find differences between these groups. Our findings may be helpful in understanding voting habits, not only among co-owners in selected Condominium X, but also among all kinds of decision-makers engaged in the process of voting.

5. Discussion and conclusions

Many attempts have been made to explore voting habits, though mainly in a political context. Along with intensified research on the topic, the research gap in housing literature on voting habits still needs special attention. Only a few empirical papers have examined the issue of voting in condominiums. However, the problem has been conceptualized in a broader context of optimizing resource allocation. We aimed to gain new insight into voting habits by exploring the voting process in a condominium. The exploratory and interpretative nature of the research implied the use of both qualitative and quantitative research methods that allowed us to answer the stated questions positively. Another benefit of assembling a broad array of analytical tools was the opportunity to detect theoretically informative differences in the defined groups of voters.

There are several important areas where this study makes an original contribution to behavioral literature. First, we indicated that studies on voting habits provide a solid foundation for more context-dependent studies on the voting processes taking place in condominiums. Secondly, we suggested, based on the example of condominium associations, that other reference points can be identified to study voting habits, e.g. a voting mode (not only voters and non-voters) or the time needed to decide whether or not to vote (the problem of time lags is also underestimated). Our results also confirm that a change in voting habits may occur as a consequence of any randomized intervention.

This issue also has a practical dimension and finds references in the concept of inclusiveness in voting processes dealing with a diversity of participants (Roberson, 2006). The current studies on the voting turnout have found that internet voting is more accessible and convenient, thus having a relative advantage over traditional voting. A prevailing number of research works suggest that e-voting increases turnout across the electorate (Schaupp, 2005). Spada et al. (2015) claim that the propensity to e-vote is positively correlated with social media usage, education, and income. However, the results on factors explaining the willingness to e-vote still seem to be vague (Carter & Tech, 2012). While this study did not confirm a positive effect of e-voting on turnout, it did partially substantiate that different voting groups revealed different attitudes toward e-voting.

Several other limitations of this study need to be acknowledged. Under the current study, we have only examined one condominium association. The scope of this study is limited only to one type of resolution, which allows us to meet the requirement of repeatability of the observed phenomenon. However, as a consequence, it simplifies the analysis of the voting process in a condominium. These limitations mean that study findings need to be interpreted cautiously.

In a broader sense, research is also needed to determine whether we can observe the same patterns of voting habits in other units. A cross-national study may also be required, including institutional differences and different rules of voting. It would be interesting to assess the impact of the COVID-19 pandemic on the introduction of e-voting among a wide range of condominium associations and on voting habits.

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