DEGREE PROJECT

# Why do local governments say no to wind power?

## *A public choice approach to the use of the right to veto among Swedish municipalities*

Isak Al
Emmy Lind

**Business and Economics, master's level**
**2023**

Luleå University of Technology
Department of Social Sciences, Technology and Arts

LULEÅ UNIVERSITY OF TECHNOLOGY

[This page intentionally left blank]

**ABSTRACT**

The objective of this study is to investigate the factors that affect the use of the municipal veto regarding wind power deployment in Sweden. The study employs a public choice approach to investigate the relationship between self-interested voters and the decision-making politicians. It employs a probit model specification, which is estimated employing 303 municipal decisions in 129 Swedish municipalities over the period 2011-2021. The findings suggests that political attributes do generally not play a significant role in municipal veto decisions. Instead, in municipalities with high property prices there is a lower probability of approval whereas it is higher in municipalities with a high share of educated individuals and already installed wind power. Further research is recommended to be conducted in the future when more data is available.

# SAMMANFATTNING

Syftet med denna studie är att undersöka vilka faktorer som påverkar användningen av det kommunala vetot gällande vindkraftsutbyggnaden i Sverige. Studien tillämpar ett public choice-perspektiv för att undersöka förhållandet mellan egenintresserade väljare och beslutsfattande politiker. Den använder en probitmodellspecifikation som använder sig av 303 kommunala beslut i 129 svenska kommuner under perioden 2011–2021. Resultaten tyder på att politiska attribut i allmänhet inte spelar någon betydande roll i kommunala vetobeslut. I kommuner med höga fastighetspriser är det däremot lägre sannolikhet för ett godkänt beslut och högre sannolikhet för godkännande återfinns i kommuner med hög andel utbildade individer och stor andel redan installerad vindkraft. Ytterligare forskning rekommenderas att genomföras i framtiden när mer data finns tillgänglig.

# ACKNOWLEDGEMENTS

We would like to sincerely thank our supervisor Patrik Söderholm for all his valuable comments and support throughout the course of our thesis. We could not have wished for a better mentor. Furthermore, a big thanks to our fellow peers for valuable insights from seminars and oppositions. Then, we would like to express our gratitude to our respective families and partners, for whose support saw us through. Finally, the greatest amount of gratitude is for one another, the endless hours we sat together writing and discussing ideas and complementing each other throughout the study.

## TABLE OF CONTENTS

## LIST OF FIGURES AND TABLES

# CHAPTER 1
# INTRODUCTION

## 1.1 Background

The Swedish government aims to be in the forefront in implementing Agenda 2030 and it has therefore established ambitious energy policy goals, which declare that the energy production in Sweden will consist of 100% renewable energy by 2040[1]. To reach the goal and implement 100% renewable energy, the Swedish Energy Agency (2019) states that wind power needs to be expanded and that it is important that the expansion is distributed in an appropriate way across the country; more electricity should thus be generated in the regions where the needs are the greatest (Swedish Energy Agency, 2021). Despite the efforts that have been made in the climate and environmental policy field, the Swedish Environmental Protection Agency (2022) has concluded that the long-term environmental goals will likely not be met with current policies, and to reach the goal of 100% renewable energy by 2040, there is a need for change.

In Sweden, the local government play an important role in any wind power project, not least since these possess the right to veto a wind power project during any point in the planning process (SOU 2021:53; Pettersson, 2008). The municipal veto was established in 2009 to get a faster and simpler process from planning to implementation of wind power whilst keeping the self-governance of the Swedish municipalities intact (Swedish Energy Agency, 2017). Despite the intentions behind the implementation of the veto, the contractors in the wind energy industry have criticised the current permitting process and claim that the veto has made this process even more unpredictable (Swedish Wind Energy Association, 2010). In the first half of 2021, lack of municipal support accounted for 77 % of all reasons for rejection, which is a sharp increase from previous years (Swedish

[1] The goal has recently been discussed to change and include nuclear power as well, reformulating the goal to “100% fossil free energy”, but a new decision is still pending (Government Offices of Sweden, 2023).

Energy Agency, 2022). The local policies and institutions are thus essential to understand with respect to the progressing green transformation (Swedish Energy Agency, 2021).

The municipal veto has also been questioned by the Swedish Environmental Protection Agency (2017) as they claim that the veto is ineffective and not legally secure. The legal guidance that is available for the veto is open to many interpretations, and since the decisions from the municipalities do not need to be motivated, it creates inconsistent outcomes. The time required for the permitting process is long and the constructors claim that it is difficult to predict if the project will be granted permit. The permit decision may also depend on political positions and political negotiations regarding questions that have few direct connections to the establishment of wind power itself. This implies that wind power establishment is not necessarily evaluated on its own merits, but rather becomes a point of political bargaining (Swedish Environmental Protection Agency, 2017).

The amount of installed onshore wind power varies significantly among the Swedish municipalities (Ek et.al., 2013; Lauf et al., 2020). Sweden is divided into four electricity price areas (SE1, SE2, SE3 and SE4) and currently the demand is larger in the south of Sweden (SE3 and SE4) while most of the electric power generated is in the north (SE1 and SE2) (Swedish Energy Agency, 2023). The demand and price of electricity thus vary between the areas and there must be a flow of electricity from SE1 and SE2, respectively, to SE3 and SE4 to cover demand in the south (Ekonomifakta, 2022). Electricity cannot be stored efficiently, and there must always be a balance between how much electricity is supplied and how much is used (Swedish Energy Agency, 2022e). This is called the power balance and if the balance cannot be maintained, power shortages can occur. It is thus of interest to establish more wind power in SE3 and SE4 where the demand is high to avoid power shortages and achieve a more optimal distribution of electricity production (Swedish Society for Nature Conservation, 2021).

The electricity market in Sweden has been deregulated since 1996, and the principle is that the market price will signal where expansion of new electricity generation capacity is necessary (Swedish Energy Agency, 2021b). Private contractors want to make a profit on their wind power investment and thus aim to place the wind turbines where wind conditions are good. Still, the municipal veto can halt expansion and force deployment to take place in areas with less favourable conditions, in turn leading to higher total costs for the electricity system (Swedish Energy Agency, 2021a).

Today, 27 TWh is produced by wind power every year in Sweden (Ekonomifakta, 2023) and it is necessary to produce between 70-106 TWh annually in the future to reach the goal of 100% renewable energy (Svenska Kraftnät 2019; Swedish Energy Agency 2019). The current policies impede the expansion of wind power in Sweden (Swedish Energy Agency, 2022; Swedish Environmental Protection Agency, 2023b; SOU 2021:53) and it is therefore necessary to review the issues identified in the process.

In conclusion, the goal of reaching 100% renewable energy by 2040 demands expansion of wind power in Sweden. The current permitting process with the municipal veto has been criticised by government authorities as well as by the industry. By looking at the geographical distribution of wind power, it becomes apparent that the expansion is not based on where it is most beneficial to establish wind power and that it is important to look at the effect of institutional and socio-economic factors (Ek et al, 2013, Toke et al., 2006). It is therefore of interest to investigate why municipalities choose to use the veto and review the problems identified in the permit process.

### 1.2 The objective

The municipal veto in Sweden presents an interesting case study since the Swedish permit process to establish wind power is unique. The contractors in the industry have claimed that the process is unpredictable and difficult to navigate, and the Swedish Environmental Protection Agency (2017) agrees while also criticising the effectiveness of the veto. Since the Swedish municipal veto can be used at any time during the process, it is interesting to understand why the veto is used, i.e., what factors that increase the probability for it to be exercised.

The aim of this thesis is therefore to investigate different factors that affect the use of the municipal veto. The present study will therefore examine variables that may have affected the use of the municipal veto regarding new establishments of wind power in Sweden, this to find out what characterizes a municipality that is more inclined to use the veto.

### 1.3 Method and Data

This study will use an econometric approach since the objective is to find connections between municipal characteristics and the municipal decision outcome (yes/no). Since the dependent variable, the municipal decision outcome, is binary it is deemed appropriate to use a probit model. The study will use a public choice framework (see Chapter 4) and variables of interest are thus political variables such as electoral votes in the local election, municipal governance, and election participation to name a few. The study also includes control variables, such as age, education level, windspeed and other socio-economic and geographical variables that have been shown in precious work to have either a positive, negative, or ambiguous relationships with wind power deployment at the regional level. The analysis builds on 303 observations of veto decisions that have been made from 2011 until 2021. The study will conduct multiple different model specifications to capture the different constellations of power within the Swedish municipal councils and executive boards. Different interaction variables and effects will also be included in the models.

### 1.4 Delimitations

The present paper solely investigates the behaviour of Swedish municipalities between 2011 and 2021 because of the available data. The municipal decisions are only taken regarding wind power on land hence the analysis and conclusions only apply to land-based wind power. Furthermore, the study only investigates 129 of the 290 total municipalities since these municipalities are the only ones that has exercised their right to use the municipal veto decisions. Although the municipal planning monopoly could be exercised in many different instances where the municipality can contribute to the shutdown of projects, this study only aims to investigate the municipal veto regarding wind power deployment. This study aims to find relationships between socio-economic, political, and spatial variables and municipal decisions. It has no interest in evaluating whether the municipal veto is used socio-economically efficient or how any actor should behave within the permitting process.

### 1.5 Outline of the remainder of the study

There are eight chapters that sums up the present study. The next chapter (2) further introduces the municipal veto and chapter 3 aims to collect the previous literature within public opinion, political effects, and enablers/obstacles of wind power deployment. Chapter 4 presents the theoretical framework based on public choice theory and explains the relevant theoretical application that is best suited for the study. Chapter 5 and 6 describe the chosen method and the data that are used in the study. Chapter 7 presents the findings of the paper, and the two final chapters aim to discuss the findings, connect it to previous literature as well as identify implications for further research.

## CHAPTER 2
## WIND POWER IN SWEDEN AND THE MUNICIPAL VETO

This chapter provides a background for wind power in Sweden and explains how the municipal veto works regarding new establishments of wind power. To better understand what influences the outcome of wind power applications, and particularly the role of local authorities and environmental factors, a brief introduction to the Swedish permitting process is also included.

### 2.1 Wind power in Sweden

The first major wind turbines in Sweden were established in 1983 (Swedish Energy Agency, 2021b). This early wind power expansion was mostly located in areas where the electricity needs were the greatest and the wind conditions were good, i.e., in southern and southwestern Sweden's plains, along coasts and on the island Gotland. After detailed wind-mapping of Sweden in the early 2000s, it was discovered that the wind conditions in forest landscapes were good enough to establish wind power. This led to an expansion in central- and northern Sweden as well. The total expansion of wind power in Sweden since the year 2004 up until 2021 is presented in Figure 2.1.

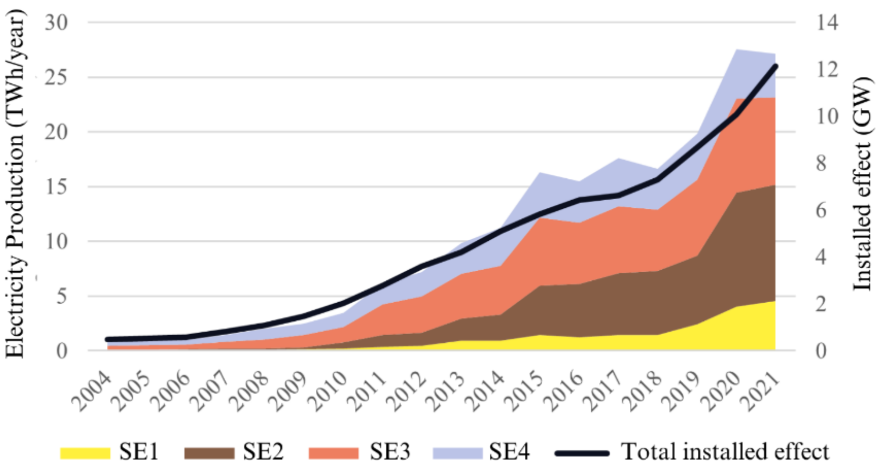


**Figure 2.1: Total wind power production (TWh) and capacity (GW) 2004-2021**
Source: Swedish Energy Agency (2023b).

Today, wind power has relatively low (lifetime) production costs compared to other kinds of electricity production (Swedish Energy Agency, 2021a). The expansion has therefore continued and wind power in Sweden accounted for 19% of the country's total electricity production in 2022 (Swedish Energy Agency, 2023a). However, no specific target for the expansion of wind power in Sweden exists today and the policy goals that exist for renewable energy are general and not directed towards a particular type of power source (Swedish Energy Agency, 2021b).

In 2011, the country was divided into four different electricity price areas to manage the bottlenecks in transmission capacity of electricity from the surplus in the north (SE1 and SE2) to the deficit in the south (SE3 and SE4) (Svenska Kraftnät, 2022b). In the presence of bottlenecks, prices will vary across the price areas, and if so, there will be higher revenues to be gained to add production capacity in southern Sweden where the electricity needs are high (e.g., Swedish Energy Markets Inspectorate, 2023). The price differences also provide an indicator as to where additional investments in network capacity are the most beneficial. The wind power is heterogeneously spread all over Sweden (see Figure 2.2), with the majority located in northern Sweden (SE1 and SE2) although the electricity demand is larger in the south (Swedish Energy Agency, 2023b).

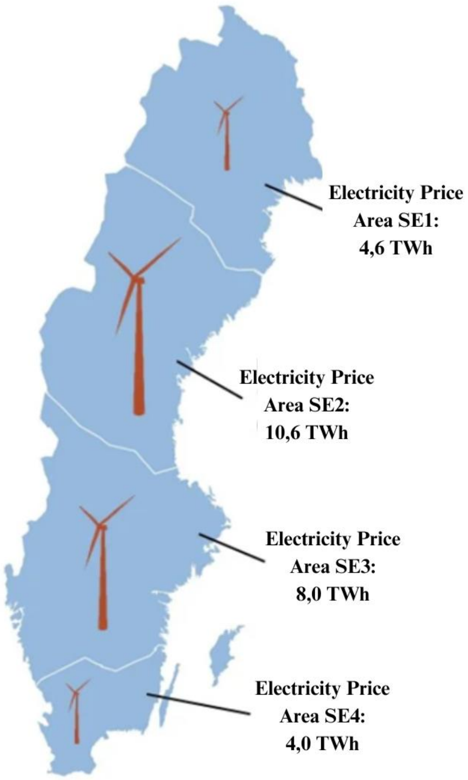


**Figure 2.2: Wind power production and capacity at the end of 2021 in the respective electricity price areas.** Source: Swedish Energy Agency (2023b).

### 2.2 The municipal veto

In Sweden, there is emphasis on self-governance of Swedish municipalities, hence a veto regarding wind power planning was introduced in 2009 to keep the municipal influence over the use of land and water. The veto replaced the previous system to get a faster and simpler process from planning to the implementation of wind power. However, the contractors in the wind power industry have often expressed that the process remains unpredictable, ineffective, and difficult to navigate (Swedish Environmental Protection Agency, 2017).

In each municipality there is a publicly elected assembly, the municipal council, which decides on municipal matters. The municipal council appoints the municipal executive board, which leads and coordinates municipality work (Government Offices of Sweden, 2015). To clarify the distribution of responsibilities in the decision-making process, the Swedish Energy Agency (2015) has published a report in which they describe the roles of the most important actors in the permitting process for wind power installations.

*The municipality* has different responsibilities in the permitting process. Apart from the power to decide whether wind power can be built in the municipality through the municipal veto, they can bring action during the process to safeguard environmental- and other general interests within the local area. The municipality can at multiple times decide to provide opinions of the planned establishment of wind power, both during early dialogue between the contractor, municipal representatives, and the county board as well as in connection with the permit application. The municipality can also influence wind power establishments in the municipality through planning of land and water areas.

*The environmental permit delegations* (at the County Administrative Boards) decide on permits for wind power installations on land according to rules stipulated in the Swedish Environmental Code. Lastly, *the contractor* is responsible for consulting with affected municipalities, County Administrative Boards and others who are affected by the planned wind power establishment. The contractors are also responsible for producing the permit application that is used in the decision of the municipal veto as well as an environmental impact statement that emphasises the issues that need to be analysed to decide according to the Environmental Code (Swedish Energy Agency, 2015).

The Swedish Energy Agency (2017) asserts that the municipality determines whether the decision regarding the application is made by the municipal council, municipal executive board or another board or committee. This flexibility exists in order to facilitate faster administration of the decision on municipal approval. The decision does not need to be motivated by the municipality, but it should include an assessment whether the wind power establishment constitutes a suitable land and water use seen from a long-term sustainability perspective. The municipalities are also responsible to implement a zoning-and layout plan; yet it is not bound in the sense that they do not actually need to follow it. It is recommended that a municipality that is negative towards the establishment of wind power makes this known in the early stages of the consultation process. This enables the wind power contractor to assess if it is even worth moving forward with the project (e.g., Swedish Energy Agency, 2017). The government can, in theory, interfere with the planning monopoly that the municipalities possess if their planning policy battles with national interests (Swedish Environmental Code, 2022). However, this rarely happens (Ståhl, 2019).

The municipal approval or denial cannot be appealed, although it could be tested for legality if there is a reason to believe that the municipality has made a formal error or exceeded its power. Since the decision cannot be appealed and the municipality is not obliged to provide a motivation of the decision, the municipal veto has been questioned (Vretling et al., 2022). The veto can be used at any moment, which in some instances cause perennial projects to perish (Ståhl, 2019; Pettersson, 2008). A distinctive example of this is where one of the biggest Swedish actors, Vattenfall, after receiving confirmation of approval from the municipality would see themselves halted five years later by the municipal veto decision costing the company over SEK 10 million. A report from the Ministry of Climate and Enterprise (2022) further comments on the reasons for denials and discusses public opinion as a key factor.

One important aspect when it comes to expanding renewable energy in Sweden is that wind turbines have a limited lifespan, and that wind parks that were established before 2015 will see the need of a generational exchange due to reached technical and economic lifespan (Swedish Environmental Agency, 2022b). Many regions are facing generational transitions regarding their wind power, with about 68% of turbines that will need to be replaced or removed by the year 2030 (Swedish Energy Agency, 2022b). To exchange and build new wind turbines, Sweden requires a well-functioning permit process. As municipalities become more resistant towards the establishment of new projects, combined with the generational transition, there is a clear risk that wind power expansion will stop on land (Swedish Energy Agency, 2022b). The Swedish Energy Agency (2017) claims that the self-governance of the municipalities would not be damaged if the veto was to be removed since they still possess planning rights over the local land and water use. Therefore, the agency recommends that the veto should be removed in its entirety.

Another reason for examining the permitting process is that a well-functioning energy supply could create incentives for energy intensive businesses to operate within domestic borders, something which is vital for upholding the competitiveness of Sweden's industry (Swedish energy agency, 2022b). By not enabling various businesses to thrive in Swedish municipalities, they might migrate away from the Swedish market which could lead to long lasting negative consequences for economic development (Bertelli, 2019).

To summarise, the municipal veto regarding wind power development in Sweden grants total power regarding the outcome of future wind power projects to the municipalities. There is a negative trend in the municipal approval of land-based wind power, something which is illustrated in Figure 2.3 (Swedish Energy Agency, 2022b). In the first half of 2021, lack of municipal approval accounted for 77% of the rejected applications. The wind power contractors have expressed that the current application process is uncertain and therefore inhibits the continued expansion of wind power (Swedish Energy Agency, 2021b). The industry also assessess that it has become increasingly difficult to obtain permits for new wind power projects, and it is difficult to find projects that are sufficiently interesting and feasible to be worth starting a permit process. This could be one reason for the decline in the number of submitted applications for onshore wind power (see Figure 2.3). The permitting process is perceived as a major risk factor and the Swedish Energy Agency claims that it is a key obstacle for the future expansion (Swedish Energy Agency, 2019).

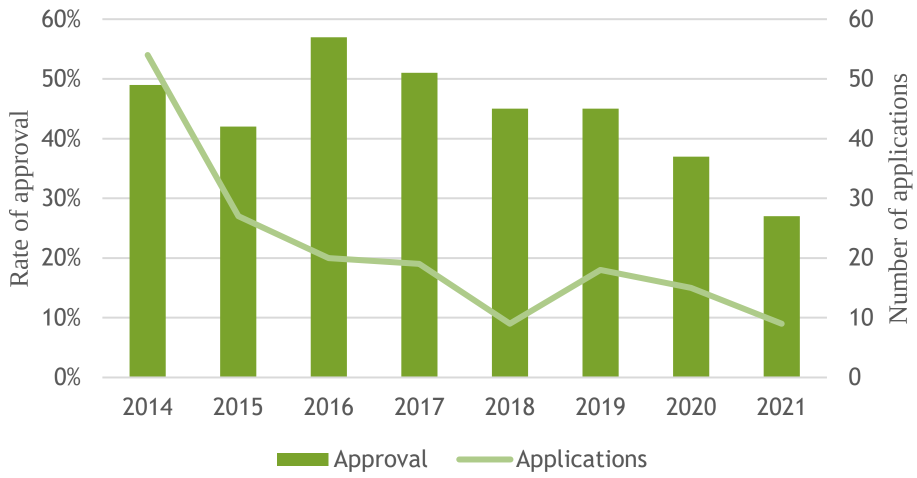


**Figure 2.3. Aggregate rate of approval and applications of wind projects in Sweden 2014 – 2021.** Source: own rendition based on Swedish Energy Agency 2022b.

# CHAPTER 3
# LITERATURE REVIEW

The objective of this chapter is to review some of the literature related to wind power in Sweden, people's attitudes towards wind power policies and the key drivers of resistance towards wind power establishment. The chapter begins with a description of the search strategy, followed by previous studies within the research field. Since this study applies a public choice perspective (see Chapter 4), the literature review will start by introducing research made on the public opinion of wind power, then move on to the political aspects of wind power projects as well as political enablers and obstacles. The chapter concludes with a discussion and a summary of the key findings from the literature review.

## 3.1 Search strategy

An extensive search has been conducted to find relevant literature regarding attitudes towards wind power, and local and national policy outcomes. The review will focus on papers with a quantitative approach but qualitative studies that are relevant to the research question will not be neglected. The databases used to conduct this review were Scopus and Google Scholar. The university library was also used to find relevant literature.

The dominating key words that have been used are *wind power, wind power attitudes, wind power Sweden, municipal veto, public choice, renewable energy, and probit model.*

## 3.2 Public opinion towards wind power

There have been multiple studies researching wind power in Sweden. Since the country aims to triple land-based wind power by 2040 and has a rather unique planning and permitting process it has been of interest for multiple authors to investigate. Ek (2005) conducted a case study on Swedish wind power, investigating the public and private attitudes towards renewable energy. She explained that although the public generally expresses a positive attitude towards wind power, the results often show that specific wind power projects face resistance from the local population. The survey results showed that most of the people questioned were positive towards wind power and that people with an interest in environmental issues were more likely to be in favour of wind power. The findings made by Ek (2005) also showed that the attitude towards wind power does not statistically differ between people with wind power installations in sight of their residence or summerhouse and those without that experience. Ek (2005) argued that this contradicts the NIMBY (Not in My Backyard) hypothesis, something that is also consistent with Wolsink (2000) who claimed that the NIMBY-explanation might be too simplistic and that institutional factors have a greater impact than public opinion. Söderholm et al. (2007) also discussed the general attitude towards wind power and described that although the Swedish public has expressed a generally positive attitude towards wind power, this support is not always reflected in the planning and implementation stage as it is when it is fully established.

Valivand (2021) investigated if socio-economic variables and natural environment affects the use of the municipal veto to block wind power projects in Sweden during 2010-2019. The study used a linear, probit and logit model and concluded that there were several variables that affected the outcome of the permit process such as population density, unemployment, income, and affiliation to the green party (Miljöpartiet) and Swedish democrats (Sverigedemokraterna). The study analysed 350 observational data from 144 municipalities with 19 observations being removed from the analysis because the applications were withdrawn prior to municipal decision. The study employed public choice theory to analyse the phenomena. The study concluded by stating that more research needs to be done, using more variables to find other relationships than the ones found by that study.

There have also been studies made on the public opinions towards wind power in other countries. Jarvis (2022) studied several factors that affected the extent of local approval of renewable energy in the UK. The data accounted for roughly 4000 wind- and solar projects spanning back three decades. The study found that hostilities were more apparent on a local level rather than national. The key driver of the local resistance was based on visual- and noise pollution. Jarvis (2022) built on prior revealed preference studies. He used a fixed effects regression analysis and found evidence that local planning decisions were responsive to local factors; for instance, 1% decrease in property values implies a 1.5% reduction in the likelihood of approval. He added that previous studies found negative effects on property values at distances up to four kilometres to a nearby wind park and that this phenomenon is particularly the case in wealthier areas. The data used contained both completed- and failed projects. In order to deconstruct the hedonic effect that wind has on property values – he accounted for both proximity and line-of-sight visibility. Jarvis (2022) stated that the larger the wind turbines are, or if they are sited in conservative areas where property values are high, the more likely they are to be met with resistance.

Another study conducted regarding the public opinion is done by Roddis et al. (2018). That paper analysed the effect that community acceptance had on planning applications for wind and solar farms in Great Britain from 1990 to 2017. The study is brought up by the need to understand the phenomenon of public acceptance, and its impact on energy policy and deployment. Roddis et al. (2018) divided public acceptance into three categories (1) socio-political, which is the acceptance by policymakers and the general public; (2) market, which is the acceptance of the technology which can be measured by willingness to pay studies and (3) communities, which is the acceptance by the local communities that are directly affected by the implementation. The study delimited by only investigating the community acceptance and employ a binomial logistic regression to analyse the contributing factors relating to outcomes of planning applications. Roddis et al. (2018) focused on Great Britain because the member nations (England, Scotland, and Wales) all inhibited similar planning legislation and have comparable data available which would facilitate the regression. The study also found that bigger wind parks are faced with more resistance on a local level.

Harper et al. (2017) explained that the permitting process, and its effect on the overall deployment needs to be further examined. The study used a logistic regression to assess which variables affect the outcome of wind turbine planning by using a range of physical, geographical, demographic, and political factors. The authors highlighted recent studies that explored the role of key factors such as the local community and local characteristics such as the proximity to protected habitat designations by the United Nations. Similar studies showed at that time that there was a link between high income, age, and higher education on the one hand and decreasing support for wind power developments on the other. The result validated previous literature by emphasising the effect that political ideology has on the overall attitude where republicans are found to be more negative towards wind power. There was also a relationship between having a high income, high age, and a university degree with negative attitudes. Harper et al. (2017) also mentioned the need for further research on variables that are non-physical in its nature, such as community engagement.

Harper et al. (2018) investigated if the planning success of proposed wind turbine projects across Great Britain could be predicted using a range of variables, including social and political. The study emphasised that geospatial factors are important, but insufficient when assessing the suitability of potential places to deploy wind turbines. The study aimed to develop an understanding of the implications from Harper et al. (2017) regarding community engagement. Previous research has, according to the authors, neglected the influence of local communities and its relationship with project rejections. Harper et al. (2018) added to previous research by implying that conservatives are less positive towards wind power than labour- and liberal democrats. Furthermore, it added to previous literature by arguing that older individuals with a university degree and that are high income earners tend to be more negative towards the deployment of wind turbines. The authors argued that these individuals may be more effective in organising campaigns against such projects, something which in turn leads to developers avoiding more privileged areas.

Harper et al. (2018) continued by discussing the importance of the ownership structure where projects are generally seen as more favourable when owned by local actors rather than by large (external) enterprises. The authors employed a multiple logistic regression with a hierarchical approach where variables were added based on their presumed importance. Since three countries were examined, the study had to account for their differences. Whilst these could be explored using a dummy variable for each country; the authors argued that such an approach only captures the level effect and not the slope effect, and therefore only allows for limited variability between the countries. To combat this, Harper et al. (2018) created separate logistic regression models for each sub-group.

### 3.3 The political effects of wind power projects

Germeshausen et al. (2021) estimated local opposition to wind turbine deployment in Germany. They measured the share of votes received by the Green party in federal elections in relation to establishment of wind power plants but argue that the results are also transferable to local elections. The findings illustrated that additional established wind power significantly lowered the federal votes received by the green party by 17% and suggest even larger numbers in the European parliament elections. This study broke grounds due to its investigation on elections – the market in which votes are exchanged for "public-policy outcomes" – and was, according to these authors, an important complement to traditional hedonic studies.

The causality between wind turbine-deployment and decreasing votes has also been observed in Canada where estimations concluded that parties lost 4-10% of the votes in provincial elections when introducing onshore wind power (Germeshausen et al., 2021). Furthermore, Germeshausen et al. (2021) concluded that wind turbines lower the aesthetic value of a landscape, affect wildlife, and reduce local property values. Local disapproval, thus meaning lower electoral support, is according to the authors greater among seniors, and in sparsely populated areas with low rates of unemployment. Germeshausen et al. (2021) also concluded that the attitudes towards wind turbines are heavily dependent on the present exposure. It is argued that any negative perception is higher when going from zero to *n* turbines rather than adding a few turbines to an already existing stock.

Winikoff (2022) studied what affects the regulations of an emerging industry by analysing the evolvement of local wind zoning laws. The article used data from ten different states in the United States where the chosen states grant authority to zone wind energy to county governments. Winikoff (2022) included 739 counties from the ten states in his analysis and created a database with county specific setbacks: the designated minimum distance between wind facilities to nonparticipating property lines and residential structures. The study found evidence that the setback standards tend to be similar in neighbouring counties, thus suggesting that regulations may dynamically evolve as regulators learn from their own experiences, as well as those of their neighbours. The strictness of the setback regulations also corresponds with the local demand for wind energy. Moreover, counties with a greater share of seasonal homes were suggested to be more likely to establish strict setbacks. Since these counties depend more on the value of the land's natural amenities the results imply that they want to limit construction of anything that will interfere with the local landscape and their economy. Another finding by Winikoff (2022) is that political ideology appears to have an effect of the strictness of the regulations, where Republican leaning counties are more likely to endorse strict setbacks.

### 3.4 Political enablers and obstacles

Ek et al. (2013) described that, although wind power producers in all municipalities in Sweden receive the same national support for wind power production and technological advancements, municipalities differ in terms of deployed wind power. The study aimed to describe this heterogeneity by analysing local differences such as population density, land area, unemployment, environmental index, and prior experience of wind power. The scope of the study was observations before and after 2006, and where the main findings showed that the affecting factors seem to have changed between the two time periods. The study emphasised that the inclusion of institutional and socio-demographics along with traditional geographical attributes are necessary to understand the heterogeneity of deployed wind power in Sweden.

Toke et al. (2006) analysed the wind power deployment outcomes in Denmark, Spain, Germany, Scotland, Netherlands, and England/Wales. These countries were chosen because they – at the time of the study - were leaders within the wind power industry and have good levels of empirical observations. The study analysed wind resources, planning practices and systems as well as local landscape protection organisations. The chosen approach entailed that the study had no statistical method of weighing the impact of each variable. However, it becomes apparent that geographical attributes such as wind capacity are insufficient in explaining the pattern of implementation and that other institutional factors needed to be analysed.

A recent study examined the main obstacles within Swedish wind power planning and governance that may hinder a continued rapid expansion of wind power (Wretling et al., 2022). They analysed municipal policy documents and precedential court cases and implemented a focus group interview and found that the basis for decision-making has become outdated due to a lack of institutional capacity at the municipal level. They also discovered that many municipalities perceive that there exist insufficient incentives for a continued wind power expansion and that there is a large heterogeneity within wind power planning practice as well as a lack of coherence between planning and permitting. Wretling et al. (2022) concluded that the current state of municipal wind power planning needs to be updated and that there is a need for additional support at the municipal level.

Inderberg et al. (2020) statistically analysed whether environmental impact and the stance taken by local authorities influence the final licensing decision regarding wind power establishment in Norway. The authors claimed that there have not been enough studies done on the aspects that affect the final licencing outcome and thus seek to address the apparent research gap. Inderberg et al. (2020) used a new dataset based on all planned and applied wind power projects above 10 MW over the period 2000-2019. The licensing outcome (rejected or approved) is given a value dependent variable of 0 or 1 and then a multivariate logistic regression analysis is conducted. The explanatory variables are based on the various projects' Environmental Impact Assessment (EIA) scores and the attitude of the municipalities that would host the wind power projects. In conclusion, the study found strong and consistent support that a negative or neutral municipality substantially reduces the chances of a wind power project being granted a licence. (Inderberg et al., 2020).

### 3.5 Conclusions based on the literature review.

There have been several studies conducted within the field of renewable energy and the deployment process of wind power. The literature mentioned in the review above adopts different approaches and study different cases, but many seek to find what motivates the different policies and regulations established regarding wind power (Inderberg et al., 2020) what affects the outcome of them (Harper et al., 2017; Harper et al., 2018; Roddis et al., 2018) including how they affect their surroundings (Germeshausen et al., 2023; Jarvis, 2022).

The most commonly used method for measuring the impact of different variables is an econometric approach, and many of the articles use a binary regression analysis (Harper et al., 2017, 2019; Inderberg et al., 2020; Roddis et al., 2018). Although different studies use different methods to improve the regression, the viability of the variables is of utmost importance. The viability is assessed by checking for, not least, multicollinearity, heteroscedasticity, autocorrelation, and theoretical grounding (Harper et al., 2017; Harper et al., 2018). Most studies that used the logistic regression have used a hierarchical approach (Harper et al., 2017; Harper et al., 2018), and the decision whether to use a parsimonious model or a more extensive approach have typically depended on the developed framework and the conditions of the study. Harper et al. (2017; 2018) and Roddis et al. (2018) argue that, for an explorative analysis, a full regression is more viable.

The source of data is determined to be crucial to the validity of the regression. Many of the papers have thus used government data. The control variables that the studies have used are similar; many focus on age, income, and population density. Jarvis (2022), Inderberg et al. (2022) and Roddis et al. (2018) have used both approved and rejected projects or applications in their regression which they describe as an advantage in that it gives a realistic insight into the permitting process.

Another important insight that has been discovered when reviewing existing literature is the conflicting views regarding if the political ideology of the decision makers influences the permitting decisions. The Roddis et al. (2018) results imply that political factors have no significant impact on the ratio of wind power and the permitting process. However, Winikoff (2022) finds that political ideology appears to have an effect of the strictness of wind power regulations. Harper et al. (2017; 2018) and Jarvis (2022) also conclude that republicans, or conservatives, tend to have a more negative attitude towards wind power development. Furthermore, Inderberg et al. (2020) argue that if a local authority has a negative or neutral attitude towards wind power, this reduces the chances of a wind power project being granted licence. These previous studies have found a relationship between the political ideology and the attitudes towards wind power, and in extension also the outcome of the deployment.

Sweden poses an interesting case to study, and multiple authors have investigated the planning process with different approaches. Ek (2005) investigates the public opinion of wind power in Sweden and later explores the reasons behind the localisation of wind power in Sweden (Ek et al., 2013). Wretling et al. (2022) examined the main obstacles within Swedish wind power planning. The studies that have been conducted earlier have used both quantitative and qualitative approaches, but the veto has not been sufficiently investigated, this with the exception of Valivand (2021) with an econometric approach. The municipal wind power veto in Sweden is also interesting to address through a public choice perspective since the local politicians have authority and makes the final decision in the permit process. The present study thus aims to contribute to the to the research area and find reasons as to what affects the use of the veto.

# CHAPTER 4
# THEORETICAL FRAMEWORK

In this chapter, the theoretical framework based on public choice theory will be presented and discussed. Since the present study aims to explore the reasons behind the Swedish municipalities decision to use the veto, the public choice theory should give insightful connections between the opinion of the people and the outcome of the political decision.

## 4.1 Public choice theory

The articles in the literature review show that there is a connection between the political ideology of the local government and the strictness of the regulations as well as the local public resistance (Jarvis, 2022; Germeshausen et al., 2021; Harper et al., 2017; Harper et al., 2018; Roddis et al., 2018; Winikoff, 2022). Since the present study aims to investigate the effect that political ideology and politicians have on the decision to establish wind power in Sweden, the public choice theory is helpful in order to explore the connection between political decisions and public opinion.

Gawel et al. (2022) describe that public choice theory assumes that all interest groups are rent seeking and wish to maximise net benefits. Politics is hence viewed as a game among self-interested actors. Therefore, public choice theory does not seek to identify the best solutions, but to instead shed light on political outcomes (Gawel et al., 2022). It is because of this underlying nature that the framework is applicable in the empirical context of the municipal veto.

It could be argued that the municipal veto is not beneficial on a social level, yet it is being frequently used (Swedish Energy Agency, 2021b). To fully understand the framework, Gawel et al. (2022) describes three relevant stakeholders to account for: (1) interest groups that can affect regulatory outcomes directly through lobbying; (2) voters that form their voting decision based on perceived benefits; where it has been shown by Germeshausen et al. (2021) that this group of stakeholders have been prone to alter their vote when introduced to wind turbines; and, finally, (3) politicians who seek rent by maximising their chances of being re-elected, which implies finding the policies that amount to the most votes. Politicians that aim to maximise future votes will therefore adhere to the local opinion. Gawel et al. (2022) argue that a homogenous interest group implies the best circumstances for politicians to maximise their rent seeking.

The municipal veto is a political decision made solely by the local government. The political process, its underlying reasons and invested stakeholders could be analysed through the lens of public choice theory. Since the theory emanates from the selfish behaviour of actors it can be helpful when it comes to understanding the interplay between the politic outcomes and public opinions. Gawel et al. (2022) argue that political decisions are predominantly determined by the self-interest of stakeholders. They discuss that incumbent conventional industries, that produce non-renewable energy, lobby to defend their position against new renewable energy producers.

There are some limitations of using public choice theory where the most apparent one is the assumption that political markets are inefficient where politicians act on the premise of re-election and not for the greater good. This is commonly referred to as the incentive problem (Kroszner and Stratmann, 1998). Furthermore, the notion that voters solely vote on perceived self-interest and being rational is not entirely empirically proven. Voters seems to be systematically mistaken, were voters act on intuition rather than rationally because of incomplete information. The incomplete information begets systematic biases which lead to votes on policies that are not in the best interest for the society as a whole (Caplan, 2007).

Emanating from the theoretical framework, variables that are interconnected with political attributes of the municipality is of great interest since politicians can affect the political policy outcomes. Furthermore, voters aim to maximise their own benefit while they at the same time possess theoretical power to influence public policy by affecting the politicians through their votes and opinions. Thus, this makes it important for this study to also investigate the socio-economic characteristics of the municipalities.

### 4.2 Analytical framework

To apply public choice theory to this study, an analytical framework has been developed, see Figure 4.1. First, public opinion, measured by socio-economic characteristics such as age, education and median income (see Chapter 5) will have a role in the outcome since the population can lobby and influence politicians. This can be done by threatening to use their vote in a manner that is not beneficial to the politicians (i.e. losing that vote) since they will vote according to the percieved self-interest. Furthermore, the expected profitability and benefits that the project entails are something that politicians need to consider before making a decision. It is the interplay between observed benefits from deploying wind power to the public opionion that is the foundation for the municipal decision. The politicians are the ones who have the power to make the decision on whether the project will be accepted or not and will simultaneously act similarly as the population and act according to their own self-interest (i.e. maximising votes and enabling re-election) and aim to please the public whilst not making irrational decision regarding the objectively percieved benefits. Although this study aims to analyse the outcomes of applications in different municipalities, the framework implies that the cause of the outcomes lie within public opinion and the characteristics of wind power projects.

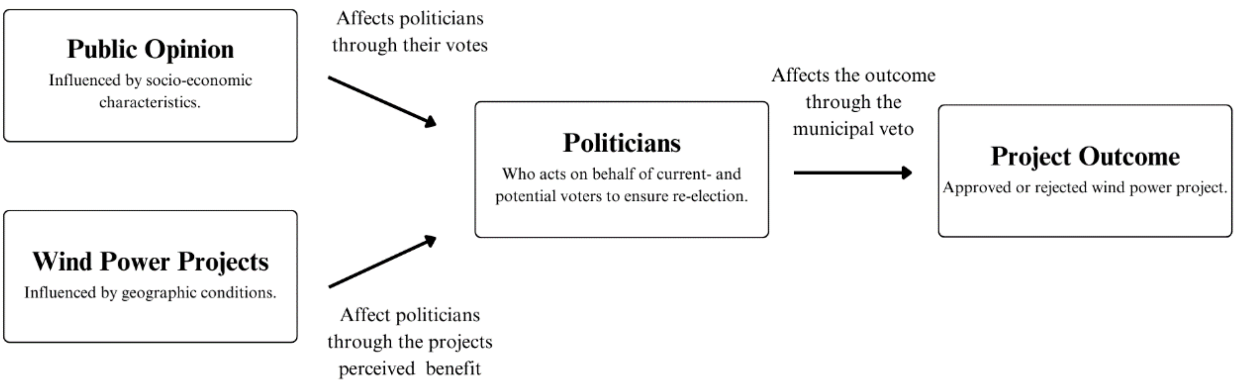


**Figure 4.1 The relationship between public opinion, wind power projects and politicians and how they hypothetically affect municipal veto outcome.**

# CHAPTER 5
# ECONOMETRIC SPECIFICATION

The aim of this chapter is to present the methodology of the study, with an emphasis on model specification. There will also be a discussion about the limitations of the chosen method and how they have been handled.

## 5.1 Method of analysis

The chosen method of analysis plays a major role in the outcome of any study (Moore et al, 2020). There are different ways of examining data on our level. However, due to the nature of this study; where the aim is to study the relationship between variables, an econometric regression model is in order (Redman, 2008). Furthermore, there are lots of regression models that can be applied, and the choice should be based on available data, scope, and nature of the study (Nyquist, 2021). Considering that the variable of interest has a binary outcome, whether the municipal veto has been used or not, a probit model is most suited for this analysis (Hair et al, 2010).

The probit model is chosen over the logit model because the statistical software that produces sample selection models uses a probit as default (see further below). To have similar models to compare, the probit model is therefore chosen. The response variable is the outcome of permitting process success or failure. Hair et al. (2010) describe the unique nature of the dependent variables that need to be considered. It is recommended that the sample size exceeds 400 to ensure reliability, but due to the nature and time limit of the study the sample size of 303 (363 in the selection model) is deemed enough. Furthermore, it is important to have enough data per group (approvals/rejections) on the dependent variable to ensure reliability, where ten observations per group per variable is recommended (Hair et al. 2010). Time effects would have been of interest to examine through fixed effects, but due to the relatively little change the variables display over time, it was not executed. However, to still account for the potential time effects, a time dummy (see chapter 6) is included.

A probit model is also sensitive to outliers, and this entails the need to modify given data. However, since the basis (acquired data) is already quite limited, each case needs to be evaluated based on the need to remove outliers with the need for sufficient observations. See Chapter 6 for descriptive statistics of the data set.

### 5.2 Probit specification

The probit model aims to find causal relationship between a discrete binary dependent variable and a vector of explanatory variables. The dependent variable thus takes a value of either one, or zero.

$$\text{y (municipal decision)} = \begin{cases} 1 \text{ (municipal approval) } \Pr(\text{p}) \\ 0 \text{ (municipal rejection) } \Pr(1-\text{p}) \end{cases} \quad (1)$$

Where Pr(p) is the probability that the municipal decision results in an approval. Pr(1-p) is the probability that the municipal decision results in a rejection. Pr(p)+Pr(1-p)=1.

Assuming the conditional probability

$$\Pr(\text{y}|\text{x}) = \Phi(\text{x}\beta) \quad (2)$$

Where Φ is described as the parametric function that can take a value between 0-1. The probit function is derived from the cumulative density function (Valivand, 2021).

The conditional probability is:

$$\Pr(\text{Y}|\text{X}) = \Pr(\text{Y} = 1|\text{X}) = \Phi(\text{X}\beta) \quad (3)$$

The variables will constitute the explanatory variables (X) which will yield the following probit model. For presentation purposes, the explanatory variables have been categorised into political, socio-economic, and spatial categories. See Chapter 6 for details.

$$\Pr(\text{Y} = 1|(\text{political}, \text{socioeconomic}, \text{spatial}) \quad (4)$$
$$= \Phi(\boldsymbol{\beta_0} + \boldsymbol{\beta_1}\text{political} + \boldsymbol{\beta_2}\text{socioeconomic} + \boldsymbol{\beta_3}\text{spatial}$$

The above specifies the group of variables that determine the effect behind municipal decisions. If any beta ($\beta$) coefficient is positive, ceteris paribus, will increase the z-value and thus increase the probability that $Y = 1$. The beta-coefficients ($\beta_1, \beta_2, \beta_3$) are vectors of coefficients for each variable that is included in the category. The drawback of the probit model is that the assumption of linearity between the parameters is violated which implies the use of the maximum likelihood estimation technique. The maximum likelihood estimation is the preferred model and is indispensable for non-linear modelling; it seeks to find the values for the parameters that makes the observed data most likely (Myung, 2002).

The maximum likelihood estimator

$$L = \prod_{i=1}^{N} P_i^{Y_i}(1 - P_i)^{1-Y_i} \tag{5}$$

Taking the logs, we obtain the "log-likelihood".

$$\ln L = \sum_{i=1}^{N} Y_i \ln(P_i) + (1 - Y_i)\ln(1 - P_i) \tag{6}$$

The statistical software, Stata, has built-in commands for regressing probit models using the maximum likelihood estimator (Stata, n.d.)

### 5.3 Correlation and multicollinearity

Variables with high correlation cause multicollinearity within the model, which often produce results that are misleading because of numerical abnormalities rather than any defects in the underlying regression theory (Nyquist, 2021). Miller and Wichern (1997) argue that redundant variables add multicollinearity and should be avoided. Myers (1986) describes how multicollinearity occurs when the regressor variables are not independent, and thus provide redundant information. Mendenhall and Sincich (2003) describe a few influential methods of detecting multicollinearity such as analysing the correlation rates between the explanatory variables, and if the signs differ from what is expected. Analysing correlated variables will be done through a correlation matrix where variables that express a linear correlation factor above 0.8 will be removed regardless of their theoretical suitability. The sign (positive or negative) will be analysed, where comments will be made if the estimated sign is reasonable. The selection of models will thus be based primarily on the theoretical relevancy of the measured characteristic and secondly based on correlation with other variables.

Due to the adopted analytical framework, based on public choice theory, which most of the variables have been chosen by, a full model is preferred over a parsimonious model (Harper et al, 2018). This entails that the political variables (election participation, public opinion, and political rule) take precedence over other socio-economic variables since this study aims to investigate the political effect primarily. The models will emanate from all control variables (socio-economic and spatial attributes) and be modified solely by the political attributes to find the most suited model.

### 5.4 Average marginal effects

Probit models do not produce coefficients that can be interpreted directly. Instead, the estimator is evaluated based on the relative sign (positive or negative) to assess whether the relationship is positive or negative. Although the main purpose of this study is not to find the relative strengths of each variable, it is of interest to assess the relative strengths of each variable for each of the models estimated. To do this, the present study will be using average marginal effects (AMEs). The average marginal effects show the marginal effects of each parameter and then averaging it for each parameter.

The equation for average marginal effect estimation:

$$\partial y/\partial x_j = AME_i \tag{7}$$

Where $\partial p/\partial x_j$ implies that the regression $\partial p$ should be partially derived with respects to each regressor variable $\partial x_j$ to obtain each individual marginal effects $AME_i$. The sum of each individual average marginal effects then is divided by the number of regressor variables to find the average marginal effects for the whole dataset.

$$\frac{\sum AME_i}{n} = AME \tag{8}$$

The coefficient from the regular probit model and marginal effect estimation will have the same sign (positive or negative sign) but the marginal effect model will include more interpretable results with the relative impact of the explanatory variable on the response variable. For example, if the marginal effect coefficient display 0,23 it implies that a one unit increase in the explanatory variable will increase the probability of approval by 23%. Therefore, we can draw conclusions from the marginal effects estimation.

**5.5 Goodness-of-fit (GOF)**

The study employs two methods to assess the goodness-of-fit and to ensure good model fit. The $R^2$ value, or the coefficient of determination, grades the predictable power of the model, and can take values between 0 and 1 where 0 indicates no predictability and 1 indicates perfect predictability. This is a very popular method of assessing goodness-of-fit (Turney, 2022). Yazici et al. (2007) stresses that for probit models, a pseudo $R^2$ needs to be used. There are many variants of the regular value, however since our statistical software uses the McFadden $R^2$ (Stata, n.d.) that will be the one that is used. Furthermore, Yazici et al. (2007) describe that the McFadden $R^2$ shares properties with the regular $R^2$ value in a more fitting matter than other pseudo $R^2$ values.

The McFadden $R^2$ is defined as:

$$R^2 = 1 - \frac{L_1}{L_0} \tag{9}$$

Where log $\mathrm{L}_1$is the log-likelihood of the full, unrestricted, model and log $\mathrm{L}_0$ is the log-likelihood of the restricted model without any explanatory variables. The ratio $\frac{L_1}{L_0}$ is then subtracted from 1 to retrieve the explanatory power of the model. Generally, a value between 0.2 and 0.4 is to be preferred, values which McFadden denotes as an excellent fit (McFadden, 1979).

Furthermore, this study also employs the Pearson $\mathcal{X}^2$ goodness-of-fit test, which is a test that could conclude whether the observed observations match the expected ones. The difference here is that a good model fit is acquired by estimating a high value for prob > chi2. Would the estimations yield low values of prob > chi2, the model is most likely suffering from a bad fit.

The Pearson $\mathcal{X}^2$ goodness-of-fit statistic is defined as:

$$\mathcal{X}^2 = \sum \frac{(O_i - E_i)^2}{E_i} \tag{10}$$

where $O_i$ is the observed frequency and $E_i$ is the expected frequency. The statistical software computes the expected values for the sample and generates the value for which will be compared to a critical level to assess its significance. The present study suffers from limited data and many variables. For this reason, it is important to test for eventual overfitting as is would imply an overall bad fit. Although it is of importance to assess the goodness-of-fit, overfitting is something that needs to be avoided. Overfitting is primarily the symptom of a model that is too complex, which will start to measure the random variable rather than the relationship between the explanatory variables. It will yield misleading $R^2$ values, significance levels and estimators (Babyak, 2004). The primary reason for overfitting is when to many restrictions are imposed to a limited data set. A good rule of thumb is approximately 10-15 observations per variable (Minitab, 2017). The present study presents several models with different number of restrictions. All estimated models satisfy this rule of thumb.

### 5.6 Selection bias

Since the data used in this study is not randomly gathered from the population, a selection bias can occur (Marchenko and Genton, 2012). This creates biased estimators and can severely affect the validity and the reliability of the findings. According to Miranda and Rabe-Hesketh (2006), sample selection is one of the most common problems in statistics and economics. These authors continue by emphasising the benefits of using Heckman's selection model, which is a probit model that accounts for selection bias, to solve this issue. Selection bias threatens both internal and external validity (Berk, 1983; Miller & Wright, 1995).

To detect if a selection bias exists in the model, the present study will use the Heckman´s selection model (Heckprob) which is conducted in the statistical software Stata. Marchenko and Genton (2012) describe this technique as simple and practical and that it offers a great solution to the problem. To fit this technique to the actual data; a small modification of the model is required. The present study has two binary selection processes. The first step is whether the project advances to a municipal decision or not: and the second being the outcome as either an approval or rejection. Furthermore, since the probit model invalidates the assumption of linear relationship with the predictors, the Heckprob is more suitable.

The probit model is as follow.

$$y_j = \Phi(x_i\beta + u_{1j}) \tag{11}$$

However, the dependent variable is not always observed as that is the case in this study. This study has 303 observations that proceeded to municipal decision and 60 observations did not. The selection criteria for why the 60 observations that did not proceed to municipal decision could be illustrated in the equation below.

$$z_j y + u_{2j} > 0 \tag{12}$$

Where $z_j$ is a binary indicator whether if the j:th observation is included in the outcome equation or not. $y$ is the vector of variables that could potentially explain the characteristics that affect the probability of selection. The left-side of the equation including the error term must exceed zero for the observation to be included in the sample. The correlation between the error term for the outcome equation $u_1$ and the error term in the selection equation $u_2$ which is denoted as $\rho$, enables the calculation of the inverse mills ratio (IMR). The IMR is then included in the outcome equation to correct for possible sample selection.

$$corr(u_1, u_2) = \rho \tag{13}$$

Heckprob is most interesting due to the *rho* ($\rho$) estimator, which estimates whether a selection bias is present in the model or not. In this study it is used as a sensitivity analysis to test the estimators with and without consideration of sample selection. Although it could be argued that a probit model that considers selection bias should be used from the beginning instead of a regular probit model, the decision to conduct a regular probit first was made since only a few observations were non-selected which is not proof enough that there *must* be a sample selection bias. The reasons as to why some project applications did not advance to a municipal decision were also unknown and it would thus have been difficult to conduct a meaningful analysis and draw conclusions with only a Heckprob.

All estimations and calculations will be done on Stata, which is a statistical software that is well-established within the academic and professional sphere (Stata, n, d.).

# CHAPTER 6
# DATA AND VARIABLE DEFINITIONS

This chapter presents the data sources and variables along with a discussion of why they are relevant to our analysis. It also includes descriptive statistics of the variables.

## 6.1 Data sources

The data in the present study represent secondary data gathered from different Swedish government agencies. The data for the explanatory variables is collected through SCB (Statistics Sweden), SKR (Swedish Municipalities and Regions) and Kolada (a municipal and regional database provided by the government). The data regarding the property prices were provided by the Swedish Broker Statistics (Svensk Mäklarstatistik), where brokers report the prices of the sold properties to provide an overall picture of the price development in the housing market. The data for the dependent variable were provided by Westander, a consulting company that has collected and compiled survey results of the outcome of the municipal decisions concerning applications regarding wind power deployment.

All observations are stated on a yearly basis and cover the period 2011-2021. The analysis is based on the 129 municipalities that has had a decision made on an application to deploy wind power between 2011 and 2021 totalling 303 observations. Further analysis (selection model) is also made on an additional dataset that includes 60 additional wind power projects that, which for unknown reasons, did not make it to a municipal decision.

## 6.2 The dependent variable

### *6.2.1 Municipal approval*

The main interest of the present study is to explore what affects the use of the municipal veto. The response variable is binary and display if the municipal veto is used or not, and where approval is coded as one (1) and a rejection as zero (0). The data contain eight partly rejected wind projects, where the application could be approved with certain conditions or that only some of the turbines mentioned in the application were given permission. These are coded as municipal rejections since they are no clear approvals. Had there been more partly rejected observations, it could be argued that each outcome (approved/rejected/partly rejected) could be analysed through a binomial model. It could furthermore be argued that there could be something to gain through removing these observations because they are neither approval nor rejection. However, due to the already limited number of observations they were kept as rejections.

Table 6.1 shows that out of the 303 submitted applications where there was a municipal decision, 75% were approved and 25% were denied. There is a larger number of applications submitted to the municipalities in the earlier years (2011-2015) of the investigated period than the latter (2016-2021). There are thus a larger number of rejections made in 2011-2015, but a marginally larger share of the submitted applications were rejected between 2016-2021.

**Table 6.1 Descriptive statistics for the dependent variable: municipal approval**

| ***Outcome*** | ***Coded as:*** | ***Number of observations*** | ***Applications 2011-2015*** | ***Applications 2016-2021*** |
|---|---|---|---|---|
| *Municipal approval* | 1 | 227 (75%) | 131 (75.3%) | 96 (74.4%) |
| *Municipal rejection* | 0 | 76 (25%) | 43 (24.7%) | 33 (25.6%) |
| *Total observations* | - | 303 | 174 | 129 |

### *6.2.2 Non-presented projects*

For reasons unknown to the authors, 60 projects did not proceed to a municipal decision. These observations did not meet the requirements specified in (eq. 12). Since the original dataset only included applications that got a final decision in the municipal permit process the 60 projects that did not make it all the way to the decision will be used to account for the potential selection problem that can occur when using only observational data. To account for this possible selection problem, another dummy variable was created which was coded as one (1) if the project proceeded to decision, otherwise zero (0). This variable is solely used for the probit model that considers sample selection (Heckprob).

Table 6.2 display all the observations that were used in the sample selection model (Heckprob). The total number of wind power project applications that were used in the analysis was 363, where 83.5% of the projects proceeded to a municipal decision and 16.5% did not.

**Table 6.2 Descriptive statistics for response variable: non-presented projects**

| *Outcome* | *Coded as:* | *Percentage of observations* | *Number of observations* |
|---|---|---|---|
| *Presented to gov.* | 1 | 83.5% | 303 |
| *Not presented to gov.* | 0 | 16.5% | 60 |
| *Total observations* | - | 100% | 363 |

## 6.3 Explanatory variables

To discover what affect the municipality to use the veto, the present study aims to test multiple different variables to either confirm or denounce their impact and statistical significance. The focus of this study will be on the political attributes, but other control variables will also be a part of the analysis. Miller and Wichern (1997) argue that the absence of key explanatory variable will cause unreliable or biased results. If variables were to be unmeasurable or nonquantifiable, a dummy variable is used. Furthermore, to find other key explanatory variables, the literature has been searched to find variables that have a strong theoretical connection to the examined phenomenon.

### *6.3.1 Political attributes*

**Municipal rule**

Previous research (Jarvis, 2022; Roddis et al., 2018; Harper et al., 2017; Harper et al., 2018; Germeshausen et al., 2021; Winikoff, 2022) has found that political ideology tends to influence the attitude towards wind power and that conservative regions tend to have a relatively lower rate of wind power acceptance and deployment. The Swedish SOM institute (2020) has survey results showing that Swedes that identify with right-winged politics are substantially less positive towards wind power compared to those that are leaning left.

To measure the effect of political rule in the municipality, the present study will use dummy variables for each political party that forms part of the municipal executive board (see table 5.3). To consider the fact that there are many different constellations within the municipal executive board, it is also of interest to – as an alternative approach - code municipal governance as either left-wing, right-wing, or mixed.

This study has employed the traditional division where Socialdemokraterna, Miljöpartiet and Vänsterpartiet exercise left-wing politics. Moderaterna, Centerpartiet, Liberalerna (formerly Folkpartiet) and Kristdemokraterna exercise right-wing politics (SKR, 2022). Municipalities where most of the municipal executive board is right-winged parties, and only one party is from the left-wing, is classified as right-winged and vice versa. This is the same classification that is used by SKR (Swedish Municipalities and Regions) where the data are gathered from. Political parties apart from the above mentioned will be coded as other parties except for the Swedish democrats which will be coded separately when assessing the share of votes.

The data contain left- and right-wing politics that stretches several years and elections back. Furthermore, since there has been relatively larger share of rejections in recent years it is of interest to see if the political effect of left- and right winged politics is visible throughout the entire time or only present recent years. It is thus of interest to create an interaction variable to see if left- or right-wing politicians have been more willing to approve wind power projects in recent years. This was done by dividing the data in two time periods, 2011-2015 and 2016-2021. Two conditions had to be met to code the observation as one (1). First, the observations had to be within the second period. Secondly, it had to be right-wing politics at that period of time. To give an example; right-wing politics in 2017 would be coded as one (1) whilst right-wing politics in 2013 would be coded as zero (0). The same procedure was done for the left-wing municipal rule.

**Share of votes**

To account for the relative power of the parties present in the municipal council and executive board, the study also includes the share of votes received by the respective parties in the municipal election. Since the decision to approve or deny a project can be done by both the municipal council and the municipal executive board it is of interest to see if the share of votes that each individual party got in the election has any effect. This also allows for interpretation of the effect of parties that are not represented in the municipal executive board but could gain indirect power in the municipal council.

The share of votes also, at least to some extent, display the political ideology of the population in the municipalities. This makes it possible to compare the results in this study with previous studies made about political ideology of the population and their opinion about wind power.

**Political engagement**

The study will use the rate of election participation as a proxy for political engagement. The theoretical framework, public choice, suggests that politicians act to maximise their own utility, i.e., getting votes (Lauf et al, 2020). If the municipality have a politically engaged public, the theory implies that the opinions of the population will have a higher effect on political decisions since more votes are on the line. With a high share of opinionated voters, the politicians have more votes to gain, or lose, by the political decision to establish wind power.

**Environmental index score**

Public opinion is voiced primarily through votes but also through polling (Lang and Lang, 1984). The environmental index used in this study, measured by Kolada (n.d.), provides the municipal populations assessment of the municipality's environmental work on a scale of 0-100. It makes it possible to assess the efforts of the municipality to ensure an environmentally sustainable lifestyle for its people. It is interesting to evaluate the public opinion of the sustainability of the municipality, since it could be argued that the municipalities with lower environmental index scores may not prioritise sustainability and renewable energy and thus become more prone to reject wind power proposals.

**Table 6.3 Descriptive statistics of the political variables.**

| *Variables* | *Description* | *Mean* | *Std.Error* | *Min* | *Max* |
|---|---|---|---|---|---|
| *Left pol.* | Left wing governance (expressed as 1 if the left-wing parties rule the municipal executive board, otherwise 0) | 0.42 | 0.03 | 0 | 1 |
| *Right pol.* | Right wing governance (expressed as 1 if the right-wing parties rule the municipal executive board, otherwise 0) | 0.30 | 0.02 | 0 | 1 |
| *i.Left pol.* | Interaction variable: left wing governance after 2015 (expressed as 1 if the left-wing parties rule the executive board during 2016-2021, otherwise 0). | 0.27 | 0.02 | 0 | 1 |
| *i.Right pol.* | Interaction variable: right wing governance after 2015 (expressed as 1 if the right-wing parties rule the executive board during 2016-2021, otherwise 0) | 0.18 | 0.02 | 0 | 1 |
| *Votes C* | Share (%) of total eligible votes received by Center-partiet in the municipal election. | 15.24 | 0.45 | 0.70 | 40.72 |
| *Votes KD* | Share (%) of total eligible votes received by Krist-demokraterna in the municipal election. | 4.77 | 0.20 | 0.17 | 25.81 |
| *Votes L* | Share (%) of total eligible votes received by Liberalerna in the municipal election. | 4.31 | 0.14 | 0.25 | 14.14 |
| *Votes MP* | Share (%) of total eligible votes received by Miljöpartiet in the municipal election. | 3.90 | 0.13 | 0.19 | 16.61 |
| *Votes M* | Share (%) of total eligible votes received by Moderaterna in the municipal election. | 14.79 | 0.35 | 0.47 | 37.42 |
| *Votes S* | Share (%) of total eligible votes received by Social-demokraterna in the municipal election. | 36.14 | 0.42 | 20.65 | 56.19 |
| *Votes SD* | Share (%) of total eligible votes received by Sverige-demokraterna in the municipal election. | 8.67 | 0.25 | 0.73 | 25.26 |

| | | | | | |
|---|---|---|---|---|---|
| *Votes.V* | Share (%) of total eligible votes received by Vänsterpartiet in the municipal election. | 6.73 | 0.22 | 0.51 | 41.91 |
| *M* | The party "Moderaterna" are included in the municipal executive board (expressed as 1 if present in the executive board, otherwise 0) | 0.34 | 0.02 | 0 | 1 |
| *V* | The party "Vänsterpartiet" are included in the municipal executive board (expressed as 1 if present in the executive board, otherwise 0) | 0.40 | 0.03 | 0 | 1 |
| *C* | The party "Centerpartiet" are included in the municipal executive board (expressed as 1 if present in the executive board, otherwise 0) | 0.51 | 0.03 | 0 | 1 |
| *KD* | The party "Kristdemokraterna" are included in the municipal executive board (expressed as 1 if present in the executive board, otherwise 0) | 0.35 | 0.03 | 0 | 1 |
| *L* | The party "Liberalerna" are included in the municipal executive board (expressed as 1 if present in the executive board, otherwise 0) | 0.35 | 0.03 | 0 | 1 |
| *S* | The party "Socialdemokraterna" are included in the municipal executive board (expressed as 1 if present in the executive board, otherwise 0) | 0.65 | 0.03 | 0 | 1 |
| *MP* | The party "Miljöpartiet" are included in the municipal executive board (expressed as 1 if present in the executive board, otherwise 0) | 0.28 | 0.02 | 0 | 1 |
| *Env. index* | Citizens' assessment of the municipality's environmental work, scale 0-100. Based on the question: "What do you think about the municipality's efforts to enable the municipality's residents to live environmentally friendly?". | 53.67 | 0.28 | 41 | 70 |
| *Election part.* | The election participation rate in the municipal election, measured in % | 82.73 | 0.13 | 70.1 | 90.4 |

### *6.3.2 Socio-economic attributes*

**Age**

Söderholm et al. (2007) found a correlation between negative attitudes towards wind power and high age. The Swedish SOM- institute (2020) supports the notion that younger people generally tend to have a more positive attitude towards wind power deployment. Furthermore, Ek (2005) finds evidence that supports these findings. The present study uses annual median age, and the data are collected from Statistics Sweden (SCB, 2023).

**Education**

This study uses the share of residents in the municipalities that have completed a higher education (3 years or more). The data are collected and compiled from Statistics Sweden (SCB, 2023). Multiple studies have found that higher education has an impact on attitudes regarding wind power and that individuals with high education tend to be more positive towards wind power (e.g., Söderholm et al, 2007; Ek, 2005). The SOM institute (2020) surveyed attitudes towards wind power deployment and found that higher educated people are generally more positive towards wind power.

**Urbanisation rate**

The SOM institute (2020) mentions that people living in urban areas tend to be more positive towards wind power deployment. Pedersen and Waye (2007) finds similar results where urban areas tend to be more positive. Information from the Swedish Energy Agency (2022d) concludes that the deployment of wind power influences the visual interpretation on the landscape. If most of the municipal population lives in cities, and wind power is in more rural areas, it could be argued that they do not become affected by the visual pollution to the same extent as people living in rural areas. Ek et al. (2013) also discuss the affect the degree of urbanisation and suggest that urban residents are more negative towards wind power deployment than rural residents due to conflicting attitudes on the preservation of landscape. Urbanisation will in this study be measured as the share of the municipal population living in urban areas (Kolada, 2023), and urban areas are defined as areas with a minimum of 200 inhabitants.

**Population density**

Population density, defined as number of inhabitants per square kilometre (SCB, 2023), is described as one of the key influencers for developing wind power (Wallenius and Lehtomäki, 2016). Furthermore, population density seems to be an interesting factor to analyse when discussing where deployment should take place (Ali et al., 2017; Hedenus et al., 2022). A municipality with high population density could make it difficult to find appropriate locations for placement, since the highly populated municipality have less space available to establish wind power. On the other hand, high population density in a municipality could mean that many people live in a concentrated area and that there is plenty of untapped areas where wind power establishment is possible. The ambiguousness of the effect that population density has on wind power development makes this variable even more interesting where research such as Frantál and Nováková (2019) finds that increased population density results in more positive attitudes towards wind power deployment while Mann et al. (2012) report a negative relationship.

**Unemployment**

Unemployment, defined as work-eligible individuals who do not currently work between ages 18 and 64 (Kolada, 2022). Unemployment is frequently used in the literature to understand the affecting factors behind the municipal veto (Ek et al., 2013). Furthermore, wind power projects entail job opportunities which may be a reason for less employed areas to be more positive towards wind power projects (Söderholm et al. 2007; Ohler, 2015).

**Median income**

The present study will use the annual median income in the municipalities to explore if income has an effect on political decisions. The data are gathered through Statistics Sweden (SCB, 2023). The SOM institute (2020) shows that high income earners tend to be more positive towards wind power deployment. Ek (2005) finds that the chance of finding individuals that support wind power deployments decreases with income. Söderholm et al. (2007) also find that increased income tends to make individuals less positive towards wind power. These findings make income and its relation to attitudes regarding wind power interesting to explore further. The choice to measure income using its median value is based on the probit models weakness to outliers, which median values can handle more effectively than mean values (Nyquist, 2021).

**Housing prices**

Previous research has shown that deploying wind power may reduce the nearby property values (Sims et al, 2010; Gibbons, 2015). The Swedish Energy Agency (2022a) has also found that property values nearby new wind turbines have decreased in some cases. Therefore, it could be argued that municipalities with higher average prices per square meter may be more reluctant towards wind power establishment since the population could fear that their real estate investment would be losing value. The present study will use data on the annual average square meter price of houses in each municipality (Svensk Mäklarstatistik, 2023). The prices for apartments will not be included due to difficulties finding complete data for all municipalities included in the analysis.

**Number of vacation houses per capita**

Since wind power projects often are located in more rural areas (Bilgili et al, 2010), it can affect the surrounding recreational possibilities. Molnarova et al, (2011) even find that landscapes with high aesthetic values affect attitudes more severely than other socio-economic attributes. It is not possible, to the authors knowledge, to find metrics for the aesthetic value of a municipality. Hence, a proxy variable for aesthetic landscapes is used with the number of vacation houses per 1000 inhabitants in the municipality (SCB, 2023).

Based on the assumption that more vacation houses is located in areas with high aesthetic values and that wind power could have a negative effect on the visual aesthetics and recreational possibilities.

**Table 6.4: Descriptive statistics of the socio-economic variables.**

| *Variables* | *Description* | *Mean* | *Std.Error* | *Min* | *Max* |
|---|---|---|---|---|---|
| *Age* | Median age in the municipality, measured as annual average. | 44.32 | 0.11 | 38.6 | 49.8 |
| *Edu. (%)* | Share of citizen´s that have a bachelor's degree or above, measured in %. | 16.50 | 0.27 | 9.57 | 41.02 |
| *Urbanisation* | Share of population living in an urban area (minimum 200 inhabitants) measured in %. | 69.04 | 0.67 | 39 | 96 |
| *Pop. density* | The population density in the municipality, measured as the number of inhabitants per square kilometre. | 21.58 | 1.97 | 0.2 | 408.7 |
| *Unemployment* | The unemployment rate in the municipality. Measured annually in %. | 6.99 | 0.1 | 2.6 | 12 |
| *Median Inc.* | Median yearly income in the municipality. Expressed in thousands SEK. | 253 | 1.22 | 203.3 | 323 |
| *Sqm price* | The annual average square meter price of sold houses. Measured in SEK. | 10580 | 339.45 | 1675 | 33920 |
| *# vacation houses* | Number of vacation houses, measured in *n* per 1000 inhabitants. | 170.17 | 8.51 | 5.07 | 867.15 |

### *6.3.3 Spatial variables*

**Electricity price area**

There are four electricity price areas in Sweden (SE1 and SE2 for northern Sweden and SE3 and SE4 for southern Sweden) (SVK, 2021). Different electricity prices among the electricity areas may influence municipal decisions regarding wind power deployment. In the past, the northern parts of Sweden have shown tendencies to be more willing towards accepting wind power projects (Swedish energy agency, 2021).

Electricity prices among SE1 and SE2 tend to follow each other and are lower than the prices in SE3 and SE4, which follow each other in a similar way (Nordpool, n.d.). Since the demand, and thus also the price, is higher in SE3 and SE4 it should be more interesting for contractors to establish wind power there. The demand and the possibility to lower the price for the residents should also create incitement for the local politicians to accept wind power projects. The acceptance rate in SE3 and SE4 are today, however, lower than in SE1 and SE2. Therefore, this study combines SE1 and SE2 into one dummy variable (1) thus leaving SE3 and SE4 as a reference (0).

**Time dummy**

Considering climate developments, municipalities may be more reluctant to reject wind projects today than previous years due to the media and public opinion. The discussion regarding achieving agenda 30 becomes more intensified which may speak to municipalities not wanting to reject projects. With rampant energy prices during recent years, there should exist additional reasons for approving wind projects today. The variable is a dummy where projects between year 2016-2021 is coded as one (1) and 2011-2015 is coded as zero (0).

**Magnitude of project**

The magnitude of the wind power project, measured by the percentage increase of wind turbines in the municipality can influence municipal decisions. The variable is constructed by taking the number of turbines in the application and divide it by the existing turbines in the municipality. If there were not any existing turbines in the municipality, the number of turbines within the application was divided by one (1) instead. To demonstrate, an application with five (5) turbines presented to a municipality with no existing turbines would entail a 500% increase. The mechanic behind this construction entails that observations in municipalities with no existing turbines will have much higher values than municipalities with existing ones. This is intentional, introducing turbines to a municipality with no prior exposure is arguably a more extensive political process. It could be argued that larger projects affect landscape views negatively which could therefore pose a negative relationship. However, larger projects are more profitable for municipalities due to economies of scale, which should be positively related to municipal approval. The ambiguousness of these arguments creates the need to examine these phenomena further.

**Installed wind capacity (MWs)**

Studies have shown that prior exposure to wind turbines have effects on attitudes on further deployment of wind power (Ladenburg & Krause, 2011; Ladenburg 2008). This study uses the already installed capacity in the municipality, in megawatts (MWs), to explore if a similar connection occurs (Swedish Energy Agency, 2023).

**Windspeed**

Municipalities with better wind conditions may be more prone to accept wind projects. Lauf et al. (2019) use wind speed as a control variable for analysing the heterogeneity in wind power deployment. This study will use the average windspeed in the municipality, measured in m/s year 2007 (Lauf et al., 2019). The windspeed in the municipality is assumed to be the same for the entire period (2011-2021).

**Share of national interest area**

Lauf et al, (2019) describe that areas of national interest (*riksintresse*) for wind power deployment may affect municipal outcomes. The paper emphasise that areas may have multiple interests (i.e., areas that might be interesting for wind power among many other things) and found that the share of national interest areas has a marginal effect on the probability of having any capacity (MWs) addition in Swedish municipalities. This study will investigate if a relationship exists between the share of national interest areas and the municipalities decisions to allow wind power establishment.

**Protected areas**

Municipalities with a high share of protected areas - i.e., national parks and reserves, nature management areas, wildlife sanctuaries, and habitat protection areas - could be more negative towards wind projects since they want to conserve the biological diversity. Lauf et al. (2019) use protected area as one of the control variables when analysing the heterogeneity in wind power deployment across regions in Sweden, and this study will investigate if the share of protected areas in a municipality influences the municipal decision.

**Table 6.5: Descriptive statistics of spatial attributes.**

| *Variables* | *Description* | *Mean* | *Std.Error* | *Min* | *Max* |
|---|---|---|---|---|---|
| *SE1+SE2* | Electricity price area (expressed as 1 if the municipality is in electricity price area one or two, otherwise 0) | 0.42 | 0.03 | 0 | 1 |
| *Time dummy* | When the municipal decision was made (projects between year 2016-2021 is coded as one (1), otherwise 0) | 0.42 | 0.03 | 0 | 1 |
| *Project mag.* | Number of turbines in the application presented to the municipal executive board in relation to already existing turbines. | 7.61 | 0.82 | 0.0078 | 150 |
| *Inst. Wind* | Total installed wind capacity in the municipality, measured in MW. | 51.30 | 4.57 | 0 | 721 |
| *Windspeed* | Average windspeed in the region, measured in m/s (2007). | 5.88 | 0.03 | 0 | 7.36 |
| *NIshare* | Priority areas (national interest for wind deployment) in % per municipality area. | 0.03 | 0.00 | 0 | 0.19 |
| *Prot. area* | Protected areas in % per municipality area. Including national parks and reserves, nature management areas, wildlife sanctuaries, and habitat protection areas (on forest and agricultural land). | 0.04 | 0.01 | 0 | 1 |

# CHAPTER 7
# RESULTS

In this chapter the probit regression results will be presented and interpreted. A correlation and covariance matrix for all explanatory variables was generated to detect and minimise the problem of multicollinearity. Furthermore, regular probit results are presented first, along with the marginal effects for the statistically significant variables. Later the results from the Heckman sample selection probit are presented. The control variables remain the same throughout all models, and the model modifications are solely based on different perspectives of political attributes of the municipality.

## 7.1 Model presentations

Table 7.1 shows the results of estimating the Probit model for the different combinations of political variables. The dependent variable is coded so that it equals one (1) if the application to establish wind power was approved and zero (0) if otherwise. The sign of each estimated coefficient indicates whether the probability of a municipality approving an application for wind power increases or decreases following an increase in the corresponding variable. The McFadden $R^2$ estimates suggest that the 'explanatory power' of the models is relatively low but the $R^2$ is considerably higher in the more extensive *models 3 and 7*.

The highest correlation between variables was between left-winged politics (Left pol.) and the interaction variable (i.Left pol.) with a correlation coefficient of 0.73. The correlation is expected but not higher than the cut-off value of 0.8. The other variables have a significantly lower correlation rate, and all lie below 0.7 with most variables well below 0.5. Multicollinearity should thus not be a major concern. Pearson $\mathcal{X}^2$ test for goodness-of-fit indicates that models 2, 3, 6 and 7 may be overfitted since they do not pass the test whilst also being the models with the greatest number of restrictions. Models 1, 4 and 5 have a good model fit which is expected since the ratio of restrictions to total observations is the lowest among all models.

Initially, governmental rule, expressed as parties within the municipal executive board, was included in the probit (*model 1*). Problematic was however that the political party "Sverigedemokraterna" was not part of the municipal executive board in any of the observations but still obtained a rather large share of votes in the municipal election. The municipal decision can be made by either the municipal executive board or the municipal council. To account for the relative power that the parties obtain in the municipal council the dummy variables were replaced with the relative share of votes that each party received in the local election (*model 2*). Thirdly, we combined model 1 and model 2 into one probit (*model 3*) to account both for the effect of the parties present in the municipal board as well as their relative share of power within the municipal council. Since the complexity of the political sphere is substantial, it could be misleading to analyse individual parties. Hence, left-wing, and right-wing politics is included in *model 4* together with an interactive dummy variable that measures right- and left-wing politics during later years (*model 5*) and excluding all individual political variables and the relative share of votes. The penultimate model (*model 6*) excluded the interactive dummy variable but included the relative share of votes for each party. The final model included the left- and right-wing variables, the interaction variables, and the share of votes that the parties got in the municipal election (*model 7*).

From a statistical point of view, it is most relevant to analyse coefficients for variables that are statistically significant. The statistical significance values of the variables display whether the value of the coefficients differ from zero or not. Economic literature typically considers coefficients with p-values below 0.5, and in some cases 0.1, as statistically significant but coefficients with higher p-values could also be important although the precision and reliability are reduced (Moore and McCabe, 2020).

Starting with the political variables, *models 1 and 3* show that if the right-wing party "Moderaterna" is present in the municipal executive board the probability to get an approval on the application is affected negatively. In *model 3* the share of votes that "Moderaterna" received in the municipal election is also statistically significant, although only at the 5 % level, but contradicting to being present in the municipal executive board, the share of the votes "Moderaterna" receives affect the possibility to get an approval positively. *Models 2, 3, 6 and 7* display statistical significance of the share of votes that "Centerpartiet" and "Liberalerna" receive in the municipal election where both increases the probability for approval. Although the coefficients for votes on "Liberalerna" are more statistically significant than "Centerpartiet", which only is statistically significant at the 10% level. *Models 5 and 7* show that left winged governance during 2015-2021 has a statistically significant negative effect on the probability of approval while left winged governance during the entire period (2011-2021) has no statistical bearing.

The control variables are somewhat less consistent in statistical significance throughout the models. The share of the municipality that is of national interest for wind deployment, the already installed wind capacity and the electricity price area seems to have importance in some of the models. The already installed wind capacity tend to affect the probability to get a municipal approval positively and if the project is located in the north of Sweden (SE1 and SE2) it decreases the probability of approval. The square meter price of houses displays a robust negative effect on the probability of approval, and the share of higher educated people in the municipality has a positive effect among all models, which is consistent with the results of previous studies. The coefficient for percentage increase of turbines in the municipality (project magnitude) displays an increase in probability of approval throughout all seven models. The remainder of the variables have no statistical significance.

**Table 7.1 Probit regression results.**
(Note: Standard Errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.10.)

| ***Variable*** | ***Model 1*** | ***Model 2*** | ***Model 3*** | ***Model 4*** | ***Model 5*** | ***Model 6*** | ***Model 7*** |
|---|---|---|---|---|---|---|---|
| *Right pol.* | | | | -0.2318 | 0.1005 | -0.4678* | -0.1774 |
| | | | | (0.2467) | (0.3462) | (0.2827) | (0.3763) |
| *Left pol.* | | | | -0.3198 | 0.2547 | -0.3479 | 0.1809 |
| | | | | (0.2356) | (0.3630) | (0.2664) | (0.3750) |
| *i.Right pol.* | | | | | -0.6359 | | -0.5870 |
| | | | | | (0.4760) | | (0.4896) |
| *i.Left pol.* | | | | | -1.00004** | | -0.9963** |
| | | | | | (0.4734) | | (0.4899) |
| *Votes S* | | 0.0258 | 0.0244 | | | 0.0235 | 0.0223 |
| | | (0.0178) | (0.0197) | | | (0.0189) | (0.0191) |
| *Votes MP* | | 0.0180 | 0.0194 | | | 0.0141 | 0.0090 |
| | | (0.0548) | (0.0623) | | | (0.0151) | (0.0547) |
| *Votes V* | | -0.0228 | -0.0156 | | | -0.0234 | -0.0236 |
| | | (0.0273) | (0.0279) | | | (0.0276) | (0.0279) |
| *Votes C* | | 0.0325* | 0.0512** | | | 0.0361* | 0.0322* |
| | | (0.0173) | (0.0207) | | | (0.0185) | (0.0188) |
| *Votes L* | | 0.1350*** | 0.1222** | | | 0.1387*** | 0.1348*** |
| | | (0.0484) | (0.0504) | | | (0.0492) | (0.0498) |
| *Votes M* | | 0.0264 | 0.0475* | | | 0.0228 | 0.0176 |
| | | (0.0218) | (0.0247) | | | (0.0221) | (0.0226) |
| *Votes KD* | | -0.0092 | 0.0093 | | | -0.0095 | -0.0098 |
| | | (0.0297) | (0.0331) | | | (0.0300) | (0.0303) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Votes SD* | | -0.0179 | -0.0310 | | | -0.0358 | -0.0451 |
| | | (0.0284) | (0.0312) | | | (0.0305) | (0.0314) |
| *M* | -0.5049* | | -0.7827** | | | | |
| | (0.2723) | | (0.3164) | | | | |
| *V* | 0.1579 | | 0.1753 | | | | |
| | (0.2143) | | (0.2422) | | | | |
| *C* | 0.3091 | | 0.2912 | | | | |
| | (0.2694) | | (0.2914) | | | | |
| *KD* | 0.1394 | | -0.1088 | | | | |
| | (0.2888) | | (0.3231) | | | | |
| *S* | 0.0359 | | -0.1071 | | | | |
| | (0.3193) | | (0.3685) | | | | |
| *L* | 0.2286 | | 0.2902 | | | | |
| | (0.2762) | | (0.2874) | | | | |
| *MP* | 0.0749 | | 0.0203 | | | | |
| | (0.2306) | | (0.2465) | | | | |
| *Election. part* | -0.0567 | -0.0209 | -0.0128 | -0.0612 | -0.0540 | -0.0228 | -0.0170 |
| | (0.0535) | (0.0561) | (0.0599) | (0.0512) | (0.0512) | (0.0566) | (0.0569) |
| *Env. index* | 0.0291 | 0.0242 | 0.0342 | 0.0269 | 0.0262 | 0.0227 | 0.0211 |
| | (0.0237) | (0.0250) | (0.0258) | (0.0232) | (0.0233) | (0.0249) | (0.0250) |
| *SE1+SE2* | -0.3533 | -0.7616** | -0.6009 | -0.3939 | -0.5736 | -0.8018* | -1.0280** |
| | (0.3957) | (0.4596) | (0.4738) | (0.3908) | (0.4067) | (0.4667) | (0.4948) |
| *Project mag.* | 0.0233** | 0.0272** | 0.0264** | 0.0228** | 0.0250** | 0.0267** | 0.0289*** |
| | (0.0102) | (0.0112) | (0.0114) | (0.0097) | (0.0100) | (0.0108) | (0.0109) |
| *NIshare* | -4.8994** | -2.4213 | -4.0363 | -3.7095 | -3.4387 | -2.0179 | -1.6500 |
| | (2.3791) | (2.4674) | (2.6265) | (2.2811) | (2.3116) | (2.4980) | (2.5294) |
| *Prot. area* | -0.3546 | -0.3012 | -0.1955 | -0.2937 | -0.4309 | -0.2341 | -0.3890 |
| | (0.9137) | (0.9002) | (0.9505) | (0.9035) | (0.8764) | (0.9175) | (0.8938) |
| *Inst. Wind* | 0.0021 | 0.0031** | 0.0029** | 0.0021 | 0.0023* | 0.0028* | 0.0031** |
| | (0.0014) | (0.0015) | (0.0015) | (0.0013) | (0.0014) | (0.0015) | (0.0015) |
| *Windspeed* | -0.2485 | -0.3732 | -0.3554 | -0.2535 | -0.4082 | -0.2945 | -0.4430 |
| | (0.2758) | (0.2773) | (0.2970) | (0.2684) | (0.2844) | (0.2854) | (0.3007) |
| *Edu (%)* | 0.1141*** | 0.1314*** | 0.0976** | 0.1370*** | 0.1390*** | 0.1399*** | 0.1396*** |
| | (0.0442) | (0.0472) | (0.0495) | (0.0445) | (0.0455) | (0.0479) | (0.0489) |
| *Unemployment* | -0.0843 | 0.0298 | 0.0310 | -0.0596 | -0.0336 | 0.0437 | 0.0714 |
| | (0.0733) | (0.0809) | (0.0868) | (0.0695) | (0.0712) | (0.0812) | (0.0830) |
| *Age* | -0.0733 | -0.0615 | -0.0896 | -0.0354 | -0.0468 | -0.0284 | -0.0464 |
| | (0.0894) | (0.0957) | (0.0989) | (0.0903) | (0.0912) | (0.0972) | (0.0988) |
| *Median. Inc* | -0.0083 | -0.0012 | -0.0014 | -0.0068 | -0.0083 | 0.0013 | 0.0002 |
| | (0.0092) | (0.0105) | (0.0111) | (0.0090) | (0.0092) | (0.0107) | (0.0108) |
| *Pop. density* | 0.0002 | 0.0021 | 0.0030 | 0.0004 | 0.0003 | 0.0030 | 0.0031 |
| | (0.0030) | (0.0032) | (0.0033) | (0.0030) | (0.0030) | (0.0032) | (0.0033) |
| *Urbanisation* | -0.0167 | -0.0146 | -0.0118 | -0.0177 | -0.0186 | -0.0154 | -0.0170 |
| | (0.0119) | (0.0127) | (0.0130) | (0.0118) | (0.0119) | (0.0128) | (0.0130) |
| *Sqm. price* | -0.00007** | -0.0001*** | -0.0001** | -0.00007** | -0.00006* | -0.0001*** | -0.0001** |
| | (0.00003) | (0.00004) | (0.00004) | (0.00003) | (0.00003) | (0.00004) | (0.00004) |
| *# vacation houses* | 0.0002 | 0.0009 | 0.0008 | 0.0002 | 0.0004 | 0.0007 | 0.0009 |
| | (0.0010) | (0.0010) | (0.0011) | (0.0010) | (0.0010) | (0.0010) | (0.0010) |
| *Time dummy* | 0.2427 | 0.3494 | 0.3409 | 0.1834 | -0.4097 | 0.3018 | -0.2556 |
| | (0.2962) | (0.3104) | (0.3172) | (0.2943) | (0.4232) | (0.3139) | (0.4406) |
| *_cons* | 10.9696* | 3.8412 | 3.7014 | 9.3648 | 10.6856* | 1.9415 | 3.9709 |
| | (6.2641) | (6.7410) | (6.9291) | (6.2646) | (6.3360) | (6.9043) | (7.0229) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ***Prob* > *chi*$^2$** | 0.0018 | 0.0002 | 0.0003 | 0.0007 | 0.0004 | 0.0002 | 0.0001 |
| ***LR chi*$^2$** | 49.10 (24) | 58.31 (25) | 66.88 (32) | 45.15 (19) | 49.74 (21) | 61.59 (27) | 65.84 (29) |
| **McFadden *R*$^2$** | 0.1439 | 0.1708 | 0.1959 | 0.1323 | 0.1457 | 0.1804 | 0.1929 |
| **Goodness-of-fit** | 0.4336 | 0.0065 | 0.0435 | 0.4823 | 0.5976 | 0.0078 | 0.0038 |

It is not possible to interpret the magnitudes of the parameter estimates in any meaningful way in a Probit model. To interpret the relative magnitudes of the coefficients, the average marginal effects of the statistically significant variables in *models 1-7* are presented in Table 7.2.

The marginal effects show that a one percent unit increase in the votes received by "Centerpartiet" and "Liberalerna" will increase the probability of an approval with about 1 respectively 3 percent. If the municipality had a left winged municipal executive board after 2015 the probability for an approval decreased with roughly 26 % (*model 5 and 7*). The intensity of the project, i.e., the number of wind turbines in the application relative to the already installed number of turbines in the municipality, has a small yet positive effect on the outcome of the application. Thus, if the number of turbines in the municipality would increase with one percentage units (1%) the probability of approval of the application would increase with 0.63-0.74%. The same trend is visible in the already installed wind capacity (measured in TW). If the already installed wind power capacity were to increase with one percent, the application would have a slight increased chance of approval (0.06-0.08%).

The share of people having a higher education has a positive influence on the application, where a one percent (1%) increase in the share of higher educated people - increase the probability of approval with approximately 3%. The average square meter price of houses has an effect. The broker data is listed in Swedish crowns (SEK), hence the average marginal effects shows that if the square meter price increases by one (1) SEK, the probability of approval decreases with 0.003%. This result might seem like it has an insignificant effect but if the result is aggregated it may provide a more realistic view of the results. Therefore a 100 SEK increase in square meter price would decrease the probability of an approval with 20-30%.

**Table 7.2 Average marginal effects.**

(Note: Standard Errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.10.)

| ***Variable*** | ***Model 1*** | ***Model 2*** | ***Model 3*** | ***Model 4*** | ***Model 5*** | ***Model 6*** | ***Model 7*** |
|---|---|---|---|---|---|---|---|
| *i.Left pol.* | | | | | -0.2688**<br>(0.1247) | | -0.2546**<br>(0.1228) |
| *Right pol.* | | | | | | -0.1216*<br>(0.0726) | |
| *Votes C* | | 0.0085*<br>(0.0045) | 0.0130**<br>(0.0051) | | | 0.0094**<br>(0.0047) | 0.0082*<br>(0.0047) |
| *Votes L* | | 0.0354***<br>(0.0124) | 0.0311**<br>(0.0126) | | | 0.0361***<br>(0.0125) | 0.0345***<br>(0.0124) |
| *Votes M* | | | 0.0121**<br>(0.0062) | | | | |
| *M* | -0.1361*<br>(0.0722) | | -0.1992**<br>(0.0782) | | | | |
| *Project mag.* | 0.0063**<br>(0.0027) | 0.0071**<br>(0.0029) | 0.0067**<br>(0.0029) | 0.0072**<br>(0.0026) | 0.0067***<br>(0.0026) | 0.0069**<br>(0.0027) | 0.0074***<br>(0.0027) |
| *Inst. Wind* | | 0.0008**<br>(0.0004) | 0.0007**<br>(0.0004) | | 0.0006*<br>(0.0004) | 0.0007**<br>(0.0004) | 0.0008**<br>(0.0004) |
| *Edu (%)* | 0.0308***<br>(0.0116) | 0.0345***<br>(0.0120) | 0.0248**<br>(0.0124) | 0.0375***<br>(0.0117) | 0.0374***<br>(0.0118) | 0.0363***<br>(0.0120) | 0.0357***<br>(0.0121) |
| *Sqm. price* | -0.00002**<br>(0.00001) | -0.00003***<br>(0.00001) | -0.00003**<br>(0.00001) | -0.00002**<br>(0.00001) | -0.00002*<br>(0.00001) | -0.00003***<br>(0.00001) | -0.00003***<br>(0.00001) |
| *NIshare* | -1.3210**<br>(0.6283) | | | -1.0157*<br>(0.6158) | | | |
| *SE1+SE2* | | -0.1999*<br>(0.1195) | | | | -0.2083*<br>(0.1202) | -0.2627**<br>(0.1245) |

### 7.2 Sample selection bias

To account for the potential sample selection bias that can occur when using only observational data, the present study has conducted a Heckman probit model with sample selection (heckprob) where the results are presented in Appendix 2. The heckprob was only possible to perform results in five out of the seven models (*models 3, 4, 5, 6, and 7*) but it still provides a general perspective of how the results change between the regular probit model and when the sample selection is considered.

The main interest of the Heckman results is to find out if the original probit model suffers from sample selection bias. The LR test of independent equations confirms in all heckprob models that the probit model based on observational data has a sample selection bias. The results are otherwise similar to the probit, with the almost all the same variables displaying statistical significance and the same effect on the probability to get an approval of the application. One difference between the heckprob and the probit is that the share of votes that "Centerpartiet" receives is not statistically significant throughout the models, but the statistical significance of the variable was low in the original probit as well. Another difference between the models is that the political interaction variable, if the executive board was right- or left winged between 2016-2021, shows statistical significance at 1-5% in the Heckman but not in the original probit. The Heckman results implies that if there was either a right or left winged executive board between 2016-2021, the probability to get an approval decrease. The political variables for the entire time period (*Left pol. and Right pol.*) are positive which suggests that the decreasing probability of an approval is not apparent in the earlier years (2011-2015) and that it could be the time that the application was sent in that cause the effect.

The selection model shows the results of the coefficients that may have an effect on whether the application made it all the way to a municipal decision or if it was discarded before. The variables used in the selection probit were the same as in the original model and there are not many statistically significant results. The dummy variables for the parties that are part of the municipal executive board are only tested in *model* 3. The results imply that if "Kristdemokraterna" or "Liberalerna" is present in the executive board the probability of an application to make it to a decision decreases, findings that are statistically significant at 5%. The votes that "Kristdemokraterna" receives in the municipal election also indicate a negative effect on the probability in *models 3, 6 and 7,* although the results are only statistically significant at 5% in *models 6 and 7*. The coefficient for the population density in the municipalities are statistically significant at 10% in *models 3, 6 and 7*. If the municipality has a high population density the results imply that the probability for the application to make it all the way to an approval may increase, since the significance level only is 10% and not consistent throughout all models. The results indicate that high election participation in the municipality increases the probability for an application to be presented, a result that is consistent throughout the models although only significant at a 5-10% level in *models 4, 5, 6, and 7*.

# CHAPTER 8
# DISCUSSION

The result from this study implies that there are multiple aspects that influence the municipal decision to establish and deploy wind power. The following discussion will observe the previously presented categorisation of variables and relevant findings will be presented in order of the political-, socio-economic- and spatial attributes.

The political variables do not seem to have the effect that this study may have expected, but some of the variables still displayed statistical significance and thus tend to affect the probability of a municipal approval consistently throughout the models. The results imply that there is no difference between the left- and right winged politicians when it comes to utilising the veto, and the coefficients for the individual parties present in the municipal board does not have enough statistical significance to draw any certain conclusions. The share of votes that the parties obtain in the municipal election, and thus the relative share of power they hold in the municipal council, only provides some statistically significant variables. The ideology of the parties, and their relative share of power, does therefore not seem to have a certain effect on the outcome of the municipal decision.

The results are quite aligned with the findings made by Roddis et al. (2018), who did not find that political factors have any significant impact on the permitting decision of wind power in Great Britain. The similar results regarding political variables could be because both Roddis et al. (2018) and the present study employed a full model. The present study however contradicts the findings made by Winikoff (2022), who found that the political ideology of the government affected the outcome of the wind power planning in the United States.

Previous studies (Harper et al., 2017; Harper et al., 2018) have found that the political ideology of the population influence their attitude towards wind power developments where conservatives often are more negative. The SOM institute (2020) have found similar results in Sweden where people who identify with right winged politics are more negative towards wind power than those who lean left. Given that the present study did not get many statistically significant results regarding the political ideology of the population, i.e., the share of votes on the different parties, it is impossible to conclude whether the results support previous findings. Although this study cannot reject nor confirm that people who identify with right-winged politics oppose wind power deployment on an aggregate level, the individual right-wing parties “Centerpartiet” and “Liberalerna” seem to increase the probability of approval while the findings for the remaining two parties “Moderaterna” and “Kristdemokraterna” are ambiguous. It is however noteworthy that this study has not presented statistically significant estimators for left-wing politics and its individual parties. This implies that although “Centerpartiet” and “Liberalerna” have a positive effect on the chance of approval – left-wing parties could potentially be even more positive – thus rendering right-wing politics “negative” in relation to left-wing politics. However, if the theory of public choice is applied to the results it would imply that the politicians may not be as sensitive to the inhabitants’ opinions as the framework suggests.

The socio-economic attributes of a municipality seem to influence the outcome of the municipal veto decision. If the municipality has a large share of highly educated inhabitants, the probability that the municipality will accept the project increases. This result corresponds with earlier studies made by Söderholm et al. (2007) and Ek (2004). The Swedish SOM-institute (2020) also concluded that people with higher education generally have a more positive attitude towards wind power. Public choice states that politicians try to align their actions with public opinion to maximise their utility and thus get (re-)elected. If the population of a municipality are positive towards wind power deployment the politicians may be able to accept a wind power project without fear that it could possibly affect their future political position negatively.

Our results imply that higher square meter prices of houses in the municipality are decreasing the probability of an approval. Previous studies (Jarvis, 2022) have found that wind power is more likely to be met with resistance if it is located in areas with high property values. Sims et al. (2010), Gibbons (2015) and the Swedish Energy Agency (2022a) also showed that properties nearby wind turbines have often decreased in value. Therefore, the results of this study are arguably reasonable. Inhabitants with valuable properties may react strongly against establishment of wind power nearby in fear of decreasing property values. The discontent of the population in the planning process may affect the decision made by the local politicians, since they want to satisfy their voters and get re-elected.

The geographical aspects of a municipality, such as windspeed, the share of protected- and priority areas, do not seem to have any statistically significant effect on the municipal decision to establish wind power. This result is interesting since the aspects could affect the profitability of the wind power project and they should thus have an effect on politicians when making their decision. The coefficient for the share of priority areas (national interest for wind deployment) in the municipality was negative in all models but only statistically significant in one out of the seven models (*Model 1*), which makes it difficult to draw solid conclusions. However, the result suggests that a higher share of priority area in the municipality decrease the probability to get an approval. These findings suggest that there may exist a dissonance between the national interests and the municipal actions. Areas of national interest for wind power are typically characterized by favourable wind conditions but if wind power expansion is blocked from such areas, there is a risk of a sub-optimal allocation of wind power in Sweden.

The amount of already installed wind power (MWs) in the municipalities display relatively robust results throughout the models in both the probit and the Heckman. An increased amount of already installed wind power capacity tend to increase the probability of an approved wind power project. The relative size of the project, the number of turbines the wind power contractor wants to establish compared to the already installed number of turbines, also show a robust positive relationship with the probability of approval. These results imply that municipalities with prior experience of wind power display a tendency to be more willing to accept a new project. This could indicate that the population in the municipalities that do not already have installed wind power want to make sure that it is kept that way, thus making the Not in My Backyard (NIMBY) hypothesis plausible. The results are however interesting considering that establishing more wind turbines in a municipality with already installed capacity increase the risk that the municipal population will have wind power nearby and in line of sight. Therefore, the NIMBY hypothesis might be too simplistic and other factors can have a greater impact than public opinion, a finding that is consistent with the results of previous research (Ek, 2005; Wolsink, 2000).

# CHAPTER 9
# CONCLUSIONS AND AVENUES FOR FUTURE RESEARCH

The aim of this study was to investigate affecting factors for the usage of the municipal veto for wind power projects. Since the municipal decision of wind power establishment is a political decision, the political variables were expected to influence the outcome. However, they did not display the statistically significant effect as expected. The results however showed that multiple different municipal characteristics appear to affect the municipal veto decision.

The study has been conducted using a full model with variables emanating from the literature. Most of the variables that displayed statistical significance were significant throughout all seven models, which indicates robustness. However, limited observations (whilst also being observational) caused the regression to lose validity and reliability which is deemed as a crucial weakness in this study. The reason for the limited observations is because the municipal veto is arguably still in its infancy, being introduced in 2009. The authors would thus argue the need to redo a similar study in the future once the municipal veto becomes fully established and more applications are available.

This study aims to serve as a foundation for future research which implies that the data needs to be more substantial hereafter. Furthermore, the political sphere is rather complex and inconsistent with collaborations that has no root in ideology which this study has not fully taken into consideration. To combat this problem, the authors have made seven models with different constellations of variables to find political suitability, which is described in chapter 5, that did not yield sufficient results. All seven models used different approaches to measure the political influence which implies that there is not currently a viable method to measure it in a Swedish context. Further on, more qualitative research needs to be conducted to better understand the dynamics in the political sphere which will aid in making better proxy variables for political rule in the municipalities. This study focused on making a full model, since there was not much literature from Sweden during recent years which the authors could build upon. Henceforth, using this study as a foundation, future research should employ a hierarchical approach when conducting econometric analysis using the robust results that this study finds.

The motive for this paper was to find what affects the use of the municipal veto because contractors within the wind power industry and authorities criticised the municipal veto, calling it unpredictable, inconsistent, and ineffective. The result of this study can be interpreted to prove that the municipal decisions does not follow a pattern and that it is difficult to determine what would cause a municipality to use their veto to stop the establishment of the wind power project. By extension, the expansion process is difficult to navigate for contractors.

In conclusion, to establish more wind power in Sweden and reach the goal of 100% renewable energy by 2040, it is crucial for further research to be conducted to clarify the application process for all parties. For future studies, it is important to include institutional variables and look further into socio-economic factors to find what affects the future deployment of wind power. It would also be interesting to perform more qualitative research to investigate individual municipalities and decisions as well as the communication between the contractors and the municipal politicians.

## REFERENCES

Ali, Y., Butt, M., Sabir, M., Mumtaz, U., & Salman, A. (2018). Selection of suitable site in Pakistan for wind power plant installation using analytic hierarchy process (AHP). Journal of Control and Decision, 5(2), 117-128. https://doi.org/10.1080/23307706.2017.1346490

Babyak, M. A. (2004). What you see may not be what you get: a brief, nontechnical introduction to overfitting in regression-type models. Psychosomatic medicine, 66(3), 411-421. https://journals.lww.com/psychosomaticmedicine/Fulltext/2004/05000/What_You_See_May_Not_Be_What_You_Get__A_Brief.21

Bertelli, A. M. (2019). Public goods, private partnerships, and political institutions. Journal of Public Administration Research and Theory, 29(1), 67-83. doi:10.1093/jopart/muy036

Bilgili, M., Yasar, A., & Simsek, E. (2011). Offshore wind power development in Europe and its comparison with onshore counterpart. Renewable and Sustainable Energy Reviews, 15(2), 905-915. https://doi.org/10.1016/j.rser.2010.11.006.

Caplan, B. (2011). The myth of the rational voter. In The Myth of the Rational Voter. Princeton University Press. https://doi.org/10.1515/9781400828821

Ek, K. (2005). Public and private attitudes towards “green” electricity: the case of Swedish wind power. Energy Policy, 33(13), 1677-1689. https://doi.org/10.1016/j.enpol.2004.02.005.

Ek, K., Persson, L., Johansson, M., & Waldo, Å. (2013). Location of Swedish wind power—Random or not? A quantitative analysis of differences in installed wind power capacity across Swedish municipalities. Energy Policy, 58, 135-141. https://doi.org/10.1016/j.enpol.2013.02.044.

Ekonomifakta (2023) Elproduktion [2023-05-08] https://www.ekonomifakta.se/Fakta/Energi/Energibalans-i-Sverige/Elproduktion/

Ekonomifakta (2022). Elbrist. [2023-05-08] https://www.ekonomifakta.se/Fakta/Energi/Energibalans-iSverige/elbrist/#:~:text=I%20elomr%C3%A5de%201%20%E2%80%93%20Lule%C3%A5%20och,effektbalansen%20ist%C3%A4llet%20v%C3%A4ntas%20bli%20negativ

Frantál, B., & Nováková, E. (2019). On the spatial differentiation of energy transitions: Exploring determinants of uneven wind energy developments in the Czech Republic. Moravian Geographical Reports, 27(2), 79-91. https://doi.org/10.2478/mgr-2019-0007

Gawel, E., Lehmann, P., Purkus, A., Söderholm, P., & Strunz, S. (2022). Security of supply as a political bargaining issue: Why Germany opted against capacity markets. Energy Research & Social Science, 86, 102321. https://doi.org/10.1016/j.erss.2021.102321

Geijer, E., & Lundmark Essen, A. (2017). Kommunal tillstyrkan av vindkraft: Hur fungerar det idag?. Naturvårdsverket. ISBN 978-91-620-6769-4

Germeshausen, R., Heim, S., & Wagner, U. J. (2022). Support for renewable energy: The case of wind power, SSRN 3949805.

Gibbons, S. (2015). Gone with the wind: Valuing the visual impacts of wind turbines through house prices. Journal of Environmental Economics and Management, 72, 177-196. http://dx.doi.org/10.1016/j.jeem.2015.04.006

Government offices of Sweden (2015). The Swedish model of government administration. [2023-05-08] https://www.government.se/how-sweden-is-governed/the-swedish-model-of-government-administration/

Government offices of Sweden (2023). Regeringens första 100 dagar: Samarbetsprojektet klimat och energi. [2023-05-15] https://www.regeringen.se/artiklar/2023/01/regeringens-forsta-100-dagar-samarbetsprojektet-klimat-och-energi/

Harper, M., Anderson, B., James, P. A., & Bahaj, A. S. (2019). Onshore wind and the likelihood of planning acceptance: Learning from a Great Britain context. Energy Policy, 128, 954-966. https://doi.org/10.1016/J.ENPOL.2019.01.002

Harper, M., Anderson, B., James, P., & Bahaj, A. (2017). Identifying key influences for planning acceptance of onshore wind turbines. 30th International Conference on Efficiency, Cost, Optimisation, Simulation and Environmental Impact of Energy Systems, San Diego, United States. 02 - 06 Jul 2017. 12 pp.

Inderberg, T. H. J., Theisen, O. M., & Flåm, K. H. (2020). What influences windpower decisions? A statistical analysis of licensing in Norway. Journal of Cleaner Production, 273, 122860. https://doi.org/10.1016/j.jclepro.2020.122860

IPCC (2022). Klimat i förändring 2022, Att begränsa klimatförändringen. Klimatologi 68. ISSN: 1624-2258

Jarvis, S. (2022a). Is NIMBYism Standing in the Way of the Clean Energy Transition? SNS Research Brief, 84.

Jarvis, S. (2022b). The Economic Costs of NIMBYism: Evidence from Renewable Energy Projects. London School of Economics and Political Science, London, UK URL https://www.lse.ac.uk/geography-and-environment/people/academic-staff/stephen-jarvis

Jenner, S., Chan, G., Frankenberger, R., & Gabel, M. (2012). What drives states to support renewable energy?. The Energy Journal, 33(2). https://doi.org/10.5547/01956574.33.2.1

Kolada (nd.) Tätortsgrad (senaste mätningen) [Dataset] https://www.kolada.se/verktyg/fri-sokning/?kpis=61916&years=30200,30199,30198&municipals=146551&rows=municipal,kpi&visualization=bar-chart

Kolada (nd.) Invånare per kvadratkilometer, inv./antal [Dataset] https://www.kolada.se/verktyg/fri-sokning/?kpis=80460&years=30200,30199,30198&municipals=146551&rows=municipal,kpi&visualization=bar-chart

Krause, G. (Ed.). (2011). From Turbine to Wind Farms: Technical Requirements and Spin-Off Products. BoD–Books on Demand. ISBN: 978-953-307-237-1

Kroszner, R. S., & Stratmann, T. (1998). Interest-group competition and the organization of congress: theory and evidence from financial services' political action committees. American economic review, 1163-1187. https://www.jstor.org/stable/116865

Ladenburg, J. (2009). Visual impact assessment of offshore wind farms and prior experience. Applied Energy, 86(3), 380-387. doi:10.1016/j.apenergy.2008.05.005

Lang, K., & Lang, G. E. (1984). The impact of polls on public opinion. The Annals of the American Academy of Political and Social Science, 472(1), 129-142. https://doi.org/10.1177/0002716284472001012

Lauf, T., Ek, K., Gawel, E., Lehmann, P., & Söderholm, P. (2020). The regional heterogeneity of wind power deployment: an empirical investigation of land-use policies in Germany and Sweden. *Journal of Environmental Planning and Management*, *63*(4), 751-778. https://doi.org/10.1080/09640568.2019.1613221

Mann, D., Lant, C., & Schoof, J. (2012). Using map algebra to explain and project spatial patterns of wind energy development in Iowa. *Applied Geography*, *34*, 219-229. https://doi.org/10.1016/j.apgeog.2011.11.008

McFadden, D. L. 1974. Conditional logit analysis of qualitative choice behaviour. In Frontiers in Econometrics, ed. P. Zarembka, 105–142. New York: Academic Press.

McFadden, D. (1973). Conditional logit analysis of qualitative choice behavior. URL https://eml.berkeley.edu/reprints/mcfadden/zarembka.pdf

Minitab (2023) How to avoid overfitting your regression model [2023-04-07] https://blog.minitab.com/en/understanding-statistics/how-to-avoid-overfitting-your-regression-model

Miranda, A., & Rabe-Hesketh, S. (2006). Maximum likelihood estimation of endogenous switching and sample selection models for binary, ordinal, and count variables. The stata journal, 6(3), 285-308. https://journals.sagepub.com/doi/pdf/10.1177/1536867X0600600301

Molnarova, K., Sklenicka, P., Stiborek, J., Svobodova, K., Salek, M., & Brabec, E. (2012). Visual preferences for wind turbines: Location, numbers and respondent characteristics. Applied Energy, 92, 269-278. https://doi.org/10.1016/j.apenergy.2011.11.001

Moore. D. & McCabe. G (2020). Practice of Statistics for Business and Economics. Macmillan Higher Education, ISBN: 9781319324810.

Myung, I. J. (2003). Tutorial on maximum likelihood estimation. Journal of mathematical Psychology, 47(1), 90-100. doi:10.1016/S0022-2496(02)00028-7

Naturskyddsföreningen, (2021). Vanliga frågor om vindkraft. https://www.naturskyddsforeningen.se/artiklar/vanliga-fragor-om-vindkraft/

Naturvårdsverket (2023a). Agenda 2030 and the global goals for sustainable development. [2023-01-27]. https://www.naturvardsverket.se/en/environmental-work/agenda-2030-and-the-global-goals-for-sustainable-development/

Naturvårdsverket (2023b). Nationell strategi för en hållbar vindkraftsutbyggnad. [2023-01-27]. https://www.naturvardsverket.se/amnesomraden/vindkraft/nationell-strategi-for-en-hallbar-vindkraftsutbyggnad/

Ohler, A. M. (2015). Factors affecting the rise of renewable energy in the US: Concern over environmental quality or rising unemployment?. The Energy Journal, 36(2). DOI: 10.5547/01956574.36.2.5

Pedersen, E., & Waye, K. P. (2007). Wind turbine noise, annoyance and self-reported health and well-being in different living environments. Occupational and environmental medicine, 64(7), 480-486. https://doi.org/10.1136/oem.2006.031039

Pettersson, M. (2008). Renewable energy and the function of law: a comparative study of legal rules related to the planning, location and installation of windmills (Doctoral dissertation, Luleå Tekniska Universitet). https://urn.kb.se/resolve?urn=urn%3Anbn%3Ase%3Altu%3Adiva-18758

Redman, T. C. (2008). Data driven: profiting from your most important business asset. Harvard Business Press. ISBN: 1422163644, 9781422163641

Regeringens skrivelse 2021/22:247 (2022). Sveriges genomförande av Agenda 2030. https://www.regeringen.se/49aef9/contentassets/9dfa88d8317f441189ba368ef4d506ae/sveriges-genomforande-av-agenda-2030-skr.-202122247.pdf

Roddis, P., Carver, S., Dallimer, M., Norman, P., & Ziv, G. (2018). The role of community acceptance in planning outcomes for onshore wind and solar farms: An energy justice analysis. Applied energy, 226, 353-364. https://doi.org/10.1016/J.APENERGY.2018.05.087

SOM-institutet. (2020). Svenska folkets åsikter om olika energikällor 1999-2019 [SOM-rapport nr 2020:43] Den svenska miljö-, energi- och klimatopinionen (MEK).

Sustainable Development Solutions Network (2022). Europe Sustainable Development Report 2022, Achieving the SDGs. https://irp.cdn-website.com/be6d1d56/files/uploaded/europe-sustainable-development-report-2022.pdf

Ståhl, J (2019). Tio år med kommunalt veto vid prövningen av vindkraft – är det dags för en förändring? [Examensarbete, Stockholms universitet]. Juridiska institutionen. https://www.diva-portal.org/smash/get/diva2:1301280/FULLTEXT01.pdf

Swedish Energy Agency (2023) Antal verk och installerad effekt per kommun, 2003- [Dataset] https://pxexternal.energimyndigheten.se/pxweb/sv/Vindkraftsstatistik/Vindkraftsstatistik/EN0105_4.px/table/tableViewLayout2/?loadedQueryId=8229ed5c-468f-40fb-81b9-b2148108231c&timeType=from&timeValue=0

Swedish Energy Agency och Naturvårdsverket, (2017). Skrivelse: Kommunal tillstyrkan av vindkraft, Redovisning av regeringsuppdrag i regleringsbrevet för 2016.

Swedish Energy Agency, (2019). Så kan 100 procent förnybar elproduktion se ut. https://www.energimyndigheten.se/nyhetsarkiv/2019/sa-kan-100-procent-fornybar-elproduktion-se-ut/

Swedish Energy Agency. (2021a). Nationell strategi för en hållbar vindkraftsutbyggnad. ISBN: 978-91-89184-88-6

Swedish Energy Agency. (2021b). Nulägesbeskrivning - vindkraftens förutsättningar. https://www.energimyndigheten.se/globalassets/fornybart/strategi-for-hallbar-vindkraftsutbyggnad/nulagesbeskrivning_-vindkraftens-forutsattningar.pdf

Swedish Energy Agency (2022a). Vindkraftens påverkan på näringslivet och fastigheters värde. ISBN 978-91-7993-047-9

Swedish Energy Agency. (2022b). Vindkraftens tillstånd 2021. (ER 2022:16) ISSN 1403–1892 ISBN (pdf) 978-91-7993-092-9

Swedish Energy Agency. (2022c). Vindkraft och arbetstillfällen. (ET 2021:21) ISBN 978-91-7993-053-0

Swedish Energy Agency. (2022d). Vindkraft i landskapet. (ET 2021:20) ISBN 978-91-7993-051-6

Swedish Energy Agency, (2022e). Effektbrist. https://www.energimyndigheten.se/trygg-energiforsorjning/el/eleffektbrist/ [2023-05-08]

Swedish Energy Agency. (2023a). Minskad elanvändning under 2022 i Sverige. [2023-05-08] https://www.energimyndigheten.se/nyhetsarkiv/2023/minskad-elanvandning-under-2022-i-sverige/#:~:text=F%C3%B6rdelningen%20av%20elproduktion%20f%C3%B6r%20de%20olika%20kraftslagen%202022&text=Konventionell%20v%C3%A4rmekraft%20bidrog%20med%2015,januari%20och%20minst%20i%20juni.

Swedish Energy Agency (2023b). Vindkraft i Sverige. https://www.energimyndigheten.se/fornybart/vindkraft/marknadsstatistik/vindkraft-i-Sverige/

SOU 2021:53 – Statens offentliga utredningar. En rättssäker vindkraftsprövning

Swedish Energy Agency (2015). Vägledning om kommunal tillstyrkan vid tillståndsprövning av vindkraftverk. (ER 2015:05) ISSN 1403–1892

Svenska Kraftnät (2022). Kortsiktig marknadsanalys 2022. (2022/3235)

Svenska Kraftnät (2022b). Elområden. [2023-05-08] https://www.svk.se/om-kraftsystemet/om-elmarknaden/elomraden/

Svenska Kraftnät (2019). Långsiktig Marknadsanalys 2018.

Stata (2023) "Why Stata" [2023-05-08] https://www.stata.com/why-use-stata/

Svenska Kraftnät (2021) Operations and electricity markets [2023-05-08] https://www.svk.se/en/national-grid/operations-and-electricity-markets/

Sims, S., Dent, P., & Oskrochi, G. R. (2008). Modelling the impact of wind farms on house prices in the UK. International Journal of Strategic Property Management, 12(4), 251-269. DOI: 10.3846/1648-715X.2008.12.251-269

Stata (2022) "xtxtprobit" https://www.stata.com/manuals/xtxtprobit.pdf

Söderholm, P., Ek, K., & Pettersson, M. (2007). Wind power development in Sweden: Global policies and local obstacles. Renewable and sustainable energy reviews, 11(3), 365-400. https://doi.org/10.1016/j.rser.2005.03.001

SCB (2023) "Befolkningens medelålder efter region och kön år 1998-2022" [Dataset] https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__BE__BE0101__BE0101B/BefolkningMedelAlder/

SCB (2023) Befolkning 16–74 år efter region, utbildningsnivå, ålder och kön. År 1985 – 2022 [Dataset] https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__UF__UF0506__UF0506B/Utbildning/

SCB (2023) Befolkningstäthet (invånare per kvadratkilometer), folkmängd och landareal efter region och kön. År 1991 – 2022 [Dataset] https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__BE__BE0101__BE0101C/BefArealTathetKon/

SCB (2023) Sammanräknad förvärvsinkomst för boende i Sverige hela året efter region, utbildningsnivå, kön och ålder. År 2000 – 2021 [Dataset] https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__HE__HE0110__HE0110A/SamForvInk1c/?rxid=9bf53fe6-6eb6-436c-b282-f13d3bdc1ac9

Svensk Mäklarstatistik (2023) Kommunmedel 2011-2021.pdf Provided by: Hans Flink [Dataset]

Stata (n.d.) [2023-05-08] https://www.stata.com/features/overview/maximum-likelihood-estimation/

Thomas, L. (2022, November 25). Confounding Variables | Definition, Examples & Controls. Scribbr. [2023-04-03] https://www.scribbr.com/methodology/confounding-variables/

Toke, D., Breukers, S., & Wolsink, M. (2008). Wind power deployment outcomes: How can we account for the differences? Renewable and sustainable energy reviews, 12(4), 1129-1147. https://doi.org/10.1016/j.rser.2006.10.021.

Turney, S. (2022). Coefficient of Determination ($R^2$) | Calculation & Interpretation. [2023-04-03] https://www.scribbr.com/statistics/coefficient-of-determination/

United Nations (2023). Transforming our world: the 2030 Agenda for Sustainable Development. [2023-01-27]. https://sdgs.un.org/2030agenda

Wallenius, T., & Lehtomäki, V. (2016). Overview of cold climate wind energy: challenges, solutions, and future needs. Wiley Interdisciplinary Reviews: Energy and Environment, 5(2), 128-135. https://doi.org/10.1002/wene.170

Winikoff, J. B. (2022). Learning by regulating: The evolution of wind energy zoning laws. The Journal of Law and Economics, 65(S1), S223-S262. https://doi.org/10.1086/718912

Wolsink, M. (2000). Wind power and the NIMBY-myth: institutional capacity and the limited significance of public support. Renewable energy, 21(1), 49-64. https://doi.org/10.1016/S0960-1481(99)00130-5

Wretling, V., Balfors, B., & Mörtberg, U. (2022). Balancing wind power deployment and sustainability objectives in Swedish planning and permitting. Energy, Sustainability and Society, 12(1), 48. https://doi.org/10.1186/s13705-022-00376-y

Yazici, B., Alpu, Ö., & Yang, Y. (2007). Comparison of goodness-of-fit measures in probit regression model. Communications in Statistics—Simulation and Computation, 36(5), 1061-1073. DOI: 10.1080/03610910701539898

## Appendix 1. Correlation matrix

| | Time | i.Left | i.Right | L. pol. | R. pol. | SE1+2 | Edu (%) | Project mag. | Inst. Wind | NIshare | Prot. area | Unemp. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Time** | 1.0000 | | | | | | | | | | | |
| **i.Left** | -0.5198 | 1.0000 | | | | | | | | | | |
| **i.Right** | -0.4001 | -0.2887 | 1.0000 | | | | | | | | | |
| **Left pol.** | -0.1272 | 0.7256 | -0.3978 | 1.0000 | | | | | | | | |
| **Right pol.** | -0.0250 | -0.4038 | 0.7149 | -0.5565 | 1.0000 | | | | | | | |
| **SE1+SE2** | -0.0007 | 0.2790 | -0.2433 | 0.4115 | -0.3929 | 1.0000 | | | | | | |
| **Edu (%)** | 0.1351 | -0.0267 | -0.0403 | 0.0242 | 0.0273 | -0.0653 | 1.0000 | | | | | |
| **Project mag.** | -0.0999 | 0.1331 | -0.0530 | 0.0956 | -0.0966 | 0.1830 | -0.1226 | 1.0000 | | | | |
| **Inst. Wind** | 0.2657 | -0.0782 | -0.1526 | 0.0982 | -0.1832 | 0.3299 | -0.0109 | -0.2573 | 1.0000 | | | |
| **NIshare** | -0.1002 | -0.0163 | 0.1589 | -0.0542 | 0.1893 | -0.1822 | -0.1634 | -0.1296 | -0.0135 | 1.0000 | | |
| **Prot. area** | -0.0050 | 0.0416 | -0.0159 | 0.0764 | -0.0339 | 0.0399 | -0.0362 | -0.0155 | 0.0151 | -0.0169 | 1.0000 | |
| **Unemploy** | -0.1846 | 0.2330 | -0.0271 | 0.1572 | -0.1281 | 0.3327 | -0.3056 | 0.1107 | 0.0650 | -0.0085 | -0.0294 | 1.0000 |
| **Age** | 0.0430 | 0.0659 | -0.0726 | 0.1535 | -0.1428 | 0.4107 | -0.6744 | 0.0725 | 0.2367 | -0.0167 | 0.0641 | 0.2869 |
| **Median inc.** | 0.6352 | -0.3490 | -0.2569 | -0.1303 | 0.0466 | -0.2385 | 0.5130 | -0.0563 | 0.0565 | -0.0181 | -0.0235 | -0.4906 |
| **Elec. part.** | 0.1933 | -0.0375 | -0.0662 | 0.0742 | -0.0395 | -0.1831 | 0.4932 | -0.0010 | 0.0330 | 0.0016 | -0.2034 | -0.2876 |
| **Pop. density** | 0.0480 | -0.0557 | 0.0006 | -0.1292 | 0.1361 | -0.3226 | 0.5079 | -0.0771 | -0.1280 | -0.0824 | 0.0113 | -0.0681 |
| **Windspeed** | -0.0059 | -0.1816 | 0.1871 | -0.2221 | 0.3119 | -0.6162 | 0.1640 | -0.2236 | -0.1580 | 0.2956 | -0.0741 | -0.1997 |
| **Urbanization** | 0.0112 | -0.0039 | -0.0409 | -0.0584 | 0.0698 | -0.3290 | 0.5441 | 0.0265 | -0.1452 | 0.0269 | -0.0595 | 0.0066 |
| **Sqm. price** | 0.3640 | -0.2391 | -0.1070 | -0.1953 | 0.1053 | -0.3627 | 0.7141 | -0.1462 | -0.0299 | -0.1332 | 0.0117 | -0.4435 |
| **# vac house** | 0.0950 | -0.0678 | -0.0599 | -0.0021 | -0.1031 | 0.3734 | -0.3553 | -0.0679 | 0.1979 | -0.1091 | 0.1616 | -0.0775 |
| **Env. index** | -0.0039 | 0.0265 | -0.0150 | -0.0022 | 0.0896 | -0.2558 | 0.5453 | 0.0123 | -0.1851 | -0.0087 | -0.0904 | -0.1764 |
| **Votes KD** | 0.0111 | -0.1080 | 0.1476 | -0.1608 | 0.1962 | -0.2180 | 0.0754 | 0.0270 | -0.1784 | 0.0368 | -0.0398 | -0.2928 |
| **Votes C** | 0.1006 | -0.2978 | 0.3014 | -0.2770 | 0.3619 | -0.0502 | -0.3504 | -0.1024 | 0.0449 | 0.2298 | 0.0027 | -0.1007 |
| **Votes L** | -0.1075 | 0.0336 | 0.0472 | -0.0749 | 0.0962 | -0.0873 | 0.3038 | -0.0123 | -0.1602 | 0.1188 | -0.0827 | -0.2481 |
| **Votes MP** | -0.1648 | 0.0643 | 0.0976 | -0.0452 | 0.0908 | -0.3011 | 0.4781 | -0.0812 | -0.1548 | -0.0428 | -0.0752 | -0.1811 |
| **Votes M** | -0.0416 | -0.1656 | 0.1244 | -0.2659 | 0.1992 | -0.4766 | 0.3798 | -0.0424 | -0.2389 | -0.1206 | 0.0106 | -0.2470 |
| **Votes S** | -0.1752 | 0.4663 | -0.3022 | 0.5901 | -0.5171 | 0.5904 | -0.0670 | 0.2185 | 0.0411 | -0.2749 | 0.0511 | 0.3232 |
| **Votes SD** | 0.3316 | -0.3670 | -0.1334 | -0.3571 | 0.0630 | -0.4769 | -0.0896 | -0.0756 | -0.0934 | 0.1876 | -0.0846 | 0.0459 |
| **Votes V** | 0.0441 | 0.1593 | -0.1851 | 0.2284 | -0.2235 | 0.3653 | 0.0792 | 0.1567 | 0.1325 | -0.0573 | 0.2802 | 0.0881 |
| **M** | 0.0195 | -0.4438 | 0.4851 | -0.4763 | 0.6702 | -0.3133 | -0.0367 | 0.0083 | -0.1651 | -0.0176 | 0.0076 | -0.1535 |
| **V** | -0.0177 | 0.3013 | -0.3889 | 0.4310 | -0.5317 | 0.3187 | 0.0084 | 0.0330 | 0.1644 | -0.0231 | 0.0982 | 0.1714 |
| **C** | 0.0777 | -0.6209 | 0.4650 | -0.8445 | 0.6144 | -0.4191 | 0.0622 | -0.1108 | -0.0813 | 0.0813 | -0.0384 | -0.1729 |
| **KD** | 0.0514 | -0.4519 | 0.4892 | -0.5995 | 0.6927 | -0.3731 | -0.0138 | -0.1075 | -0.1562 | 0.0906 | 0.0184 | -0.0409 |
| **S** | -0.0145 | 0.4335 | -0.6465 | 0.6036 | -0.8917 | 0.2825 | 0.0314 | 0.0680 | 0.0407 | -0.1315 | 0.0027 | 0.0768 |
| **L** | 0.0447 | -0.4492 | 0.4180 | -0.6191 | 0.5846 | -0.2518 | 0.0277 | -0.0083 | -0.1157 | -0.0727 | -0.0586 | -0.1666 |
| **MP** | -0.0958 | 0.0988 | -0.0404 | 0.0568 | -0.0388 | -0.1612 | 0.1212 | 0.1350 | -0.0881 | -0.0005 | 0.0258 | 0.0401 |

| | Age | Median inc. | Elec. Part. | Pop. density | Wind-speed | Urban | Sqm. price | # vac. house | Env. index | Votes C | Votes KD | Votes L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Age** | 1.0000 | | | | | | | | | | | |
| **Median inc** | -0.4979 | 1.0000 | | | | | | | | | | |
| **Elec. Par.** | -0.3585 | 0.4716 | 1.0000 | | | | | | | | | |
| **Pop. Den.** | -0.5466 | 0.2797 | 0.7722 | 1.0000 | | | | | | | | |
| **Windspeed** | -0.3903 | 0.1984 | 0.2333 | 0.3253 | 1.0000 | | | | | | | |
| **Urban.** | -0.6522 | 0.4339 | 0.3488 | 0.5110 | 0.2782 | 1.0000 | | | | | | |
| **Sqm. price** | -0.5852 | 0.6560 | 0.3471 | 0.5580 | 0.3071 | 0.4239 | 1.0000 | | | | | |
| **# vac. house** | 0.6298 | -0.2806 | -0.3534 | -0.3488 | -0.2896 | -0.5758 | -0.1337 | 1.0000 | | | | |
| **Env. index** | -0.5074 | 0.2877 | 0.2708 | 0.3609 | 0.1989 | 0.5423 | 0.3748 | -0.4632 | 1.0000 | | | |
| **Votes C** | 0.3353 | -0.1645 | -0.2472 | -0.3317 | 0.0695 | -0.4888 | -0.2420 | 0.2958 | -0.2552 | 1.0000 | | |
| **Votes KD** | -0.2863 | 0.2239 | 0.1613 | 0.0607 | 0.2167 | 0.1003 | 0.0402 | -0.2175 | 0.1694 | -0.0468 | 1.0000 | |
| **Votes L** | -0.3511 | 0.1351 | -0.0134 | 0.2092 | 0.0536 | 0.2122 | 0.4080 | -0.0737 | 0.2411 | -0.2727 | 0.1672 | 1.0000 |
| **Votes MP** | -0.5103 | 0.0766 | 0.2789 | 0.4219 | 0.2652 | 0.3493 | 0.4632 | -0.3604 | 0.4363 | -0.2617 | 0.0136 | 0.3310 |
| **Votes M** | -0.4763 | 0.2167 | 0.1955 | 0.4163 | 0.3217 | 0.3739 | 0.4912 | -0.2506 | 0.2194 | -0.3784 | 0.0135 | 0.2402 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Votes S** | 0.2451 | -0.2402 | -0.0588 | -0.2010 | -0.4135 | -0.0843 | -0.3359 | 0.0924 | -0.0863 | -0.3038 | -0.2413 | -0.1222 |
| **Votes SD** | -0.2054 | 0.3689 | 0.1609 | 0.2168 | 0.3126 | 0.2345 | 0.2224 | -0.2294 | -0.0127 | -0.0108 | -0.0088 | -0.1924 |
| **Votes V** | 0.1569 | -0.0147 | -0.0951 | -0.0656 | -0.2576 | 0.0413 | -0.0604 | 0.1513 | 0.0400 | -0.1628 | -0.1160 | -0.0051 |
| **M** | -0.1177 | 0.0366 | -0.0572 | 0.1139 | 0.1984 | 0.0230 | 0.0771 | -0.0466 | 0.0506 | 0.3062 | 0.2331 | 0.0580 |
| **V** | 0.1474 | -0.1058 | 0.0055 | -0.0862 | -0.2297 | -0.0336 | -0.1556 | 0.0616 | -0.0586 | -0.1991 | -0.2335 | -0.0564 |
| **C** | -0.1490 | 0.1180 | -0.0020 | 0.1650 | 0.2681 | 0.1033 | 0.2303 | 0.0336 | 0.0642 | 0.2279 | 0.1566 | 0.1171 |
| **KD** | -0.1731 | 0.0610 | -0.1083 | 0.1427 | 0.2795 | 0.0741 | 0.1239 | -0.1106 | 0.0503 | 0.2728 | 0.2739 | 0.0631 |
| **S** | 0.0590 | -0.0155 | 0.1065 | -0.0862 | -0.2086 | -0.0121 | -0.0421 | 0.0687 | -0.0454 | -0.3600 | -0.1345 | -0.0573 |
| **L** | -0.1248 | 0.0899 | -0.1017 | 0.1719 | 0.0915 | 0.0096 | 0.2323 | 0.0262 | 0.0294 | 0.1675 | 0.1890 | 0.1962 |
| **MP** | -0.1856 | 0.0114 | 0.0805 | 0.2279 | 0.0749 | 0.2153 | 0.1698 | -0.1629 | 0.2294 | -0.1729 | 0.0171 | 0.0820 |

| | **Votes MP** | **Votes M** | **Votes S** | **Votes SD** | **Votes V** | **M** | **V** | **C** | **KD** | **S** | **L** | **MP** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Votes MP** | 1.0000 | | | | | | | | | | | |
| **Votes M** | 0.4672 | 1.0000 | | | | | | | | | | |
| **Votes S** | -0.2204 | -0.3110 | 1.0000 | | | | | | | | | |
| **Votes SD** | -0.0211 | 0.1551 | -0.4052 | 1.0000 | | | | | | | | |
| **Votes V** | -0.1305 | -0.2684 | 0.1359 | -0.2261 | 1.0000 | | | | | | | |
| **M** | 0.1424 | 0.2826 | -0.4702 | 0.0815 | -0.1575 | 1.0000 | | | | | | |
| **V** | 0.0224 | -0.1104 | 0.2813 | -0.0687 | 0.2672 | -0.4207 | 1.0000 | | | | | |
| **C** | 0.0877 | 0.2610 | -0.5536 | 0.2680 | -0.1749 | 0.5409 | -0.4435 | 1.0000 | | | | |
| **KD** | 0.1217 | 0.2418 | -0.4969 | 0.2044 | -0.1539 | 0.6301 | -0.4327 | 0.6241 | 1.0000 | | | |
| **S** | -0.0769 | -0.1286 | 0.5419 | -0.0704 | 0.0318 | -0.7138 | 0.4129 | -0.6844 | -0.7215 | 1.0000 | | |
| **L** | 0.1140 | 0.2469 | -0.4305 | 0.1196 | -0.1612 | 0.6475 | -0.3698 | 0.5387 | 0.5708 | -0.6057 | 1.0000 | |
| **MP** | 0.3873 | 0.2208 | -0.0640 | 0.0638 | -0.0109 | -0.0145 | 0.1210 | -0.1312 | -0.0509 | 0.0696 | -0.0088 | 1.0000 |

## Appendix 2. Heckman probit models with sample selection

(Note: Standard Errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.10.)

| Municipal decision | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|---|---|---|---|---|---|---|---|
| *Right pol.* | | | | -0.1499 | 0.3571 | -0.3384 | 0.0886 |
| | | | | (0.2013) | (0.2866) | (0.2443) | (0.3015) |
| *Left pol.* | | | | -0.1586 | 0.3528 | -0.1450 | 0.3074 |
| | | | | (0.1929) | (0.3008) | (0.2260) | (0.2908) |
| *i.Right pol.* | | | | | -0.9985*** | | -0.8575** |
| | | | | | (0.3815) | | (0.3997) |
| *i.Left pol.* | | | | | -0.9983*** | | -0.9386** |
| | | | | | (0.3876) | | (0.3895) |
| *Votes S* | | - | 0.0041 | | | -0.0021 | -0.0019 |
| | | - | (0.0170) | | | (0.0167) | (0.0164) |
| *Votes MP* | | - | 0.0455 | | | 0.0383 | 0.0326 |
| | | - | (0.0523) | | | (0.0482) | (0.0473) |
| *Votes V* | | - | -0.0234 | | | -0.0316 | -0.0282 |
| | | - | (0.0241) | | | (0.0232) | (0.0238) |
| *Votes C* | | - | 0.0341* | | | 0.0204 | 0.0187 |
| | | - | (0.0177) | | | (0.0169) | (0.0159) |
| *Votes L* | | - | 0.0833** | | | 0.1021*** | 0.0956** |
| | | - | (0.0411) | | | (0.0398) | (0.0385) |
| *Votes M* | | - | 0.0258 | | | 0.0059 | -0.0013 |
| | | - | (0.0207) | | | (0.0197) | (0.0189) |
| *Votes KD* | | - | -0.0026 | | | -0.0313 | -0.0310 |
| | | - | (0.0277) | | | (0.0243) | (0.0259) |
| *Votes SD* | | - | -0.0114 | | | -0.0165 | -0.0262 |
| | | - | (0.0273) | | | (0.0270) | (0.0268) |
| *M* | - | | -0.5336* | | | | |
| | - | | (0.2734) | | | | |
| *V* | - | | 0.1422 | | | | |
| | - | | (0.2040) | | | | |
| *C* | - | | 0.3000 | | | | |
| | - | | (0.2479) | | | | |
| *KD* | - | | -0.3492 | | | | |
| | - | | (0.2693) | | | | |
| *S* | - | | -0.2648 | | | | |
| | - | | (0.3219) | | | | |
| *L* | - | | 0.0348 | | | | |
| | - | | (0.2353) | | | | |
| *MP* | - | | -0.1391 | | | | |
| | - | | (0.2088) | | | | |
| *Election. part* | - | - | 0.0156 | -0.0010 | 0.0048 | 0.0112 | 0.0198 |
| | - | - | (0.0463) | (0.0433) | (0.0446) | (0.0480) | (0.0477) |
| *Env. index* | - | - | 0.0249 | 0.0199 | 0.0186 | 0.0179 | 0.0160 |
| | - | - | (0.0221) | (0.0193) | (0.0196) | (0.0220) | (0.0214) |
| *SE1+SE2* | - | - | -0.2940 | -0.3080 | -0.4763 | -0.4949 | -0.7207* |
| | - | - | (0.3863) | (0.2971) | (0.3006) | (0.3901) | (0.3939) |
| *Project mag.* | - | - | 0.0223*** | 0.0185** | 0.0210** | 0.0226** | 0.0241*** |
| | - | - | (0.0085) | (0.0085) | (0.0086) | 0.0089 | (0.0080) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *NIshare* | - | - | -4.2592* | -2.5907 | -2.4016 | -2.5885 | -2.3481 |
| | - | - | (2.3285) | (2.0546) | (2.0892) | (2.2644) | (2.2644) |
| *Prot. area* | - | - | 0.2564 | -0.3562 | -0.4120 | 0.2401 | 0.1491 |
| | - | - | (0.8424) | (0.8627) | (0.8092) | (0.8311) | (0.8213) |
| *Inst. Wind* | - | - | 0.0026* | 0.0022* | 0.0025** | 0.0025* | 0.0027** |
| | - | - | (0.0014) | (0.0012) | (0.0011) | (0.0014) | (0.0012) |
| *Windspeed* | - | - | -0.1763 | -0.1729 | -0.2947 | -0.1440 | -0.2799 |
| | - | - | (0.2430) | (0.1767) | (0.1872) | (0.2253) | (0.2242) |
| *Edu (%)* | - | - | 0.0579 | 0.0744** | 0.0843** | 0.0891** | 0.0902** |
| | - | - | (0.0417) | (0.0349) | (0.0350) | (0.0418) | (0.0410) |
| *Unemployment* | - | - | 0.0142 | -0.0380 | -0.0115 | 0.0179 | 0.0456 |
| | - | - | (0.0737) | (0.0567) | (0.0604) | (0.0721) | (0.0714) |
| *Age* | - | - | -0.0143 | 0.0056 | 0.0032 | 0.0189 | 0.0077 |
| | - | - | (0.0799) | (0.0730) | (0.0732) | (0.0808) | (0.0830) |
| *Median. Inc* | - | - | 0.0014 | -0.0031 | -0.0044 | 0.0043 | 0.0033 |
| | - | - | (0.0091) | (0.0076) | (0.0076) | (0.0094) | (0.0090) |
| *Pop. density* | - | - | 0.0042 | 0.0026 | 0.0023 | 0.0042 | 0.0042 |
| | - | - | (0.0032) | (0.0029) | (0.0029) | (0.0032) | (0.0033) |
| *Urbanisation* | - | - | -0.0100 | -0.0155 | -0.0175 | -0.0133 | -0.0155 |
| | - | - | (0.0115) | (0.0098) | (0.0098) | (0.0111) | (0.0111) |
| *Sqm. price* | - | - | -0.00008** | -0.00004* | -0.00004* | -0.0001*** | -0.00008** |
| | - | - | (0.00004) | (0.00002) | (0.00003) | (0.00003) | (0.00003) |
| *# vacation houses* | - | - | 0.0002 | 0.00003 | 0.0002 | 0.0005 | 0.0005 |
| | - | - | (0.0009) | (0.0008) | (0.0008) | (0.0009) | (0.0009) |
| *Time dummy* | - | - | 0.1452 | 0.0907 | -0.6106 | 0.1741 | -0.4614 |
| | - | - | (0.2664) | (0.2431) | (0.3541) | (0.2728) | (0.3731) |
| *_cons* | - | - | -1.6986 | 1.5113 | 2.3936 | -2.7354 | -1.3238 |
| | - | - | (5.8819) | (5.0492) | (5.2060) | (5.8885) | (5.9305) |
| ***Non-presented projects*** | **Model 1** | **Model 2** | **Model 3** | **Model 4** | **Model 5** | **Model 6** | **Model 7** |
| *Right pol.* | | | | -0.0110 | 0.4289 | 0.1667 | 0.4859 |
| | | | | (0.2240) | (0.3070) | (0.2863) | (0.3418) |
| *Left pol.* | | | | 0.0380 | 0.1788 | 0.1238 | 0.2330 |
| | | | | (0.2154) | (0.3085) | (0.2441) | (0.2992) |
| *i.Right pol.* | | | | | -0.7818* | | -0.6540 |
| | | | | | (0.4081) | | (0.4237) |
| *i.Left pol.* | | | | | -0.3452 | | -0.3185 |
| | | | | | (0.3980) | | (0.4116) |
| *Votes S* | | - | -0.0276 | | | -0.0302 | -0.0316* |
| | | - | (0.0212) | | | (0.0205) | (0.0184) |
| *Votes MP* | | - | 0.0722 | | | 0.0291 | 0.0395 |
| | | - | (0.0593) | | | (0.0566) | (0.0562) |
| *Votes V* | | - | -0.0362 | | | -0.0399 | -0.0420 |
| | | - | (0.0301) | | | (0.0282) | (0.0262) |
| *Votes C* | | - | -0.0208 | | | -0.0244 | -0.0244 |
| | | - | (0.0220) | | | (0.0210) | (0.0180) |
| *Votes L* | | - | 0.0298 | | | 0.0230 | 0.0226 |
| | | - | (0.0411) | | | (0.0385) | (0.0374) |
| *Votes M* | | - | -0.0240 | | | -0.0435* | -0.0418** |
| | | - | (0.0247) | | | (0.0246) | (0.0211) |
| *Votes KD* | | - | -0.0423 | | | -0.0680** | -0.0603** |
| | | - | (0.0328) | | | (0.0280) | (0.0180) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Votes SD* | | - | 0.0454 | | | 0.0264 | 0.0224 |
| | | - | (0.0380) | | | (0.0349) | (0.0310) |
| *M* | - | | 0.3286 | | | | |
| | - | | (0.3990) | | | | |
| *V* | - | | -0.0993 | | | | |
| | - | | (0.2343) | | | | |
| *C* | - | | 0.2153 | | | | |
| | - | | (0.2964) | | | | |
| *KD* | - | | -0.7497** | | | | |
| | - | | (0.2951) | | | | |
| *S* | - | | -0.5039 | | | | |
| | - | | (0.4119) | | | | |
| *L* | - | | -0.6158** | | | | |
| | - | | (0.2809) | | | | |
| *MP* | - | | -0.3222 | | | | |
| | - | | (0.2219) | | | | |
| *Election. part* | - | - | 0.0515 | 0.0984** | 0.1062** | 0.0879* | 0.0925* |
| | - | - | (0.0451) | (0.0479) | (0.0489) | (0.0525) | (0.0510) |
| *Env. index* | - | - | 0.0172 | 0.0077 | 0.0030 | 0.0094 | 0.0044 |
| | - | - | (0.0228) | (0.0212) | (0.0212) | (0.0238) | (0.0229) |
| *SE1+SE2* | - | - | 0.3336 | 0.0308 | -0.0030 | 0.2919 | 0.2419 |
| | - | - | (0.3722) | (0.3019) | (0.3020) | (0.3636) | (0.3655) |
| *Project mag.* | - | - | 0.0088 | 0.0040 | 0.0046 | 0.0092 | 0.0100 |
| | - | - | (0.0082) | (0.0078) | (0.0078) | (0.0086) | (0.0082) |
| *NIshare* | - | - | 0.1885 | 0.1476 | 0.3213 | -1.0279 | -0.6956 |
| | - | - | (2.9690) | (2.5804) | (2.6532) | (2.8510) | (2.8698) |
| *Prot. area* | - | - | 0.5026 | 0.5134 | 0.5466 | 0.6691 | 0.7121 |
| | - | - | (1.1678) | (1.1259) | (1.0626) | (1.1116) | (1.1214) |
| *Inst. Wind* | - | - | -0.0002 | 0.0004 | 0.0007 | -0.0003 | 0.00005 |
| | - | - | (0.0015) | (0.0015) | (0.0012) | (0.0014) | (0.0012) |
| *Windspeed* | - | - | 0.1190 | 0.1234 | 0.0973 | 0.1838 | 0.1602 |
| | - | - | (0.1607) | (0.1488) | (0.1485) | (0.1585) | (0.1566) |
| *Edu (%)* | - | - | -0.0454 | -0.0517 | -0.0439 | -0.0313 | -0.0223 |
| | - | - | (0.0422) | (0.0355) | (0.0361) | (0.0418) | (0.0417) |
| *Unemployment* | - | - | -0.0164 | 0.0015 | 0.0030 | -0.0729 | -0.0623 |
| | - | - | (0.0842) | (0.0609) | (0.0646) | (0.0788) | (0.0774) |
| *Age* | - | - | 0.0607 | 0.0465 | 0.0432 | 0.0784 | 0.0844 |
| | - | - | (0.0901) | (0.0803) | (0.0797) | (0.0893) | (0.0877) |
| *Median. Inc* | - | - | 0.0040 | 0.0015 | 0.00003 | 0.0002 | 0.0003 |
| | - | - | (0.0103) | (0.0083) | (0.0085) | (0.0106) | (0.0102) |
| *Pop. density* | - | - | 0.0134* | 0.0095 | 0.0090 | 0.0135* | 0.0131* |
| | - | - | (0.0075) | (0.0065) | (0.0063) | (0.0074) | (0.0072) |
| *Urbanisation* | - | - | -0.0092 | -0.0057 | -0.0082 | -0.0037 | -0.0054 |
| | - | - | (0.0136) | (0.0109) | (0.0112) | (0.0122) | (0.0121) |
| *Sqm. prices* | - | - | -0.00003 | 0.0000002 | 0.000001 | -0.00003 | -0.00003 |
| | - | - | (0.00004) | (0.00003) | (0.00003) | (0.00004) | (0.00004) |
| *# vacation houses* | - | - | -0.000002 | -0.0001 | -0.0003 | 0.000002 | 0.000001 |
| | - | - | (0.0010) | (0.0009) | (0.0003) | (0.0010) | (0.0010) |
| *Time dummy* | - | - | 0.1139 | 0.0581 | -0.3176 | 0.1494 | -0.1903 |
| | - | - | (0.3013) | (0.2751) | (0.3784) | (0.3218) | (0.4030) |
| *_cons* | - | - | -5.2012 | -9.7764* | -9.2479* | -8.0649 | -8.2065 |
| | - | - | (5.8897) | (5.1309 | (5.2077) | (6.1385) | (6.1038) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ***Athrho*** | - | - | 12.0567 | 11.5096 | 16.2427*** | 15.6662*** | 11.8667 |
| | - | - | (19.8575) | (41.6635) | (2.2593) | (5.9234) | (238.2154) |
| ***Prob>chi2*** | - | - | 0.1887 | 0.1144 | 0.0212 | 0.2321 | 0.0305 |
| ***Wald chi2*** | - | - | 38.84 (32) | 26.60 (19) | 36.12 (21) | 32.00 (27) | 44.84 (29) |
| ***LR test*** | - | - | 0.0029 | 0.0148 | 0.0120 | 0.0049 | 0.0053 |