ERASMUS UNIVERSITEIT ROTTERDAM

Erasmus School of Economics

A good neighbour is worth more than a far friend

The effect of other (surrounding) municipalities' tax rates on the Dutch municipal tax rate

Abstract

This thesis studies 424 Dutch municipalities over the period between 2014 and 2022 to investigate whether the property tax rate of a municipality is affected by the tax rates of other municipalities. A fixed effects model - with time and municipality fixed effects - is used. Two variants of the model have been exploited, one where the average tax rate of municipalities within the same province was the independent variable, and one where the tax rate of the biggest neighbouring municipality was the independent variable. A lag-structure was added to both models. The results are mixed. The first variant finds significant effects, while the second was does not result in any statistically significant results. No heterogeneous treatment effects for the number of inhabitants have been found. Heterogeneity related to differences in turnout cannot be ruled out. Potential limitations include the lack of political variables and a suboptimal definition of the independent variable. Further research is necessary to conclude whether yardstick competition exists between Dutch municipalities.

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1. Introduction

Taxation is always a very relevant political topic, because it hits people where it hurts: their wallet. The property tax for Dutch municipalities is the most important tax revenue for municipalities, although it only adds up to about 7% of the total income of municipalities(Kamerstukken II, 2022-2023, 36200 B, nr. 2).

Other sources of income for municipalities are the national funds (roughly 50% of total income) and taxes that are levied to fund specific spending (for example the tax for garbage collection). These resources can only be used to fund actual costs for garbage collection. The property tax collects about three quarters of non-earmarked own revenues, making it the most important source of revenue controlled by the municipal council.

In The Netherlands, research has shown that political preferences within a municipality do not significantly affect municipal taxes (Allers et al., 2001; Allers & Rienks, 2022). There might be other incentives for incumbent politicians to alter the level of municipal tax rates. One potential explanation is the concept that the tax rate in municipality A might be influenced by tax rates of municipalities around municipality A. Voters use information of other municipalities to judge the politicians in their own municipality. Nearby municipalities serve as a benchmark for voters. This theory is known as yardstick competition (Salmon, 1987).

In the international literature, yardstick competition is an important theory that could explain tax differences and similarities in municipal taxation. Empirical evidence shows that yardstick competition is a very relevant aspect of strategic interaction between municipalities and several studies show that nearby municipalities raising their taxes significantly affect tax rates in other municipalities (Brett & Pinkse, 2000; Fiva & Rattsø, 2007).

The last empirical study researching yardstick competition in The Netherlands is almost twenty years ago (Allers & Elhorst, 2005). They find that, on average, a 10 percent increase in the property tax rate in neighbouring municipalities leads to a 3.5 percent higher property tax rate. They also find that the effect is lower when the governing coalition has a larger majority in the municipality council. Given the relevance of the property tax for municipalities and the political importance of the tax, it is relevant for politicians, voters and policymakers to find out whether the results and conclusions of Allers & Elhorst (2005) are still true twenty years later.

Therefore, this paper aims to answer the following research question:

"To what extent is the tax rate of the onroerendezaakbelasting (a Dutch municipal property tax) affected by the tax rates in other municipalities between 2014 and 2022?"

To answer this question, I use panel data on the tax rate of the municipal property tax over the period 2014-2022. Every year the municipal council sets the tax rate, which is usually proposed by the governing coalition. A fixed effects model is constructed with time and municipality fixed effects. Control variables are turnout at municipal elections, number of inhabitants, average disposable income and average house prices. As the independent variable, two different variables are used: the average of all other tax rates of municipalities within the same province and the tax rate of the biggest neighbouring municipality in terms of inhabitants.

The results of the analysis are mixed. The analysis with the provincial average as independent variable finds highly significant results, both with the lagged as the non-lagged values of the independent variable. A one percentage point increase in the provincial average of the property tax is associated with respectively a 0.7 percentage point increase in the tax rate and a 0.3 percentage point increase for the model with a lag-structure. The version of the model where the tax rate of the biggest neighbouring municipality is the independent variable does not report any statistically significant results. Adding a lag-structure to the model does not change this. Heterogeneous treatment effects for the number of inhabitants could not be found. Testing for heterogeneity of treatment effects for the turnout at municipal election showed some statistically significant results. They implied that a higher turnout would lead to a smaller yardstick effect, while our theoretical argument suggested vice versa. Since tax rates are set simultaneously, reverse causality can not be ruled out. The literature suggests that the size of the yardstick competition effects might depend on the political situation in the municipality. Since the dataset used in this paper does not include information on majorities, seat allocations and different political parties, no tests have been performed to verify this. Further research might be relevant to understand the true effect of yardstick competition between Dutch municipalities.

The rest of this thesis is structured as follows: Section 1 describes the theoretical and empirical literature on municipal tax competition, yardstick competition and political incentives to set tax rates. Section 3 elaborates on the context and setting of Dutch municipalities and their finances. Section 4 describes the data and the empirical strategy, while Section 5 reports the main results and the results of the sensitivity analysis. Section 6 discusses these results, potential biases and limitations and provides, report policy implication and gives suggestions for further research. Section 7 summarizes and concludes. In the Appendix, there is a complete list of all the municipalities, categorized by province.

2. Theoretical framework

2.1 Theory

There are two main categories of theories that can potentially explain tax mimicking by municipalities (Brueckner, 2003). The first category consists of spillover models and the second of resource-flow models.

Spillover models include models which explain tax mimicking based on expenditure spillovers. Municipalities that are close to each other might be comparable in certain aspects that influence spending. For example, municipalities in rural areas and urban areas might differ in demographical aspects, thereby influencing spending on health care and education. To match these differences, tax levels in rural areas might be comparable to each other, and different from tax levels in urban areas. If municipalities keep developing in the same way (e.g. ageing happens in a lot of rural areas) than taxes might follow this common development and be adjusted simultaneously. Kelejian & Robinson (1993) provide empirical evidence for the expenditure spillover theory: police expenditures in US counties are affected by spending on police in nearby counties. They use a spatial regression model including two types of spatial interaction. The dependent variable, the police expenditures are related to each other, where counties that share a border function as the independent variable. Second, also the error terms of the model are related to each other. They assume two stochastic shocks in each county. One of the shocks is county-specific, and the other is not. One shock should display some spillover effects, the other should not, if police expenditures are independent of police expenditures elsewhere. They find that there are some spillover effects between different counties.

Most importantly, the model of yardstick competition also fits in this category. Yardstick competition, introduced into the field of municipal taxes by Salmon (1987), relates the tax level of municipalities to tax levels in municipalities around the municipality in question. There is a political motive for politicians to mimic tax levels of surrounding municipalities. Voters use information of other municipalities to judge the politicians in their own municipality. Nearby municipalities serve as a benchmark for voters. Then, if voters consider the relative performance of their municipality (and its politicians), it is rational for politicians to also consider nearby municipalities and mimic expenditures and tax rates.

Alternatively, the resource-flow models include models that highlight tax competition and welfare competition. In tax competition models, jurisdictions choose their tax rate while taking into account a potential flight of capital (or a different tax base). The optimal tax rate depends on tax rates elsewhere. Since the tax in question, the *onroerendezaakbelasting* (ozb) is a property tax, and since houses and other buildings are not known for their mobility, the argument becomes a bit different. Since buildings cannot be moved outside the borders of the municipality, the owner might try to sell the property, but there will always be an owner of the property as long as it exists. A capital flight due to higher property taxes therefore seems unlikely.

Tax competition might lead to residents moving in and out of municipalities due to the tax rates. This model was first introduced by Tiebout (1956). He highlighted the 'exit mechanism'. If a municipality has high tax rates, the mobile tax base (households) might be incentivised to move away. Although a reduced tax base lowers the marginal benefits of raising tax rates, the municipality needs to have a balanced budget. Therefore, tax competition could also lead to a higher tax rate, since they simply need the money.

2.2 Empirical literature

The first empirical papers related to yardstick competition and decentral tax rates are from the nineties. Case (1993) provided the first empirical evidence for yardstick competition in tax rates. She found that tax rates in US states were influenced by the tax rates in neighbouring states, but only if the governor could be re-elected at the next elections. Using instrumental values for tax changes of neighbouring states like state population and the level of per capita grands from the federal government, a two-stage least squares estimation ensures that missing variables do not lead to different results. An interaction term is included to show the results when the governor is running for re-election.

Bordignon et al. (2003) uses spatial modelling and finds the same result as Case (1993): local property taxes are spatially autocorrelated for jurisdictions where the mayor can run for re-election. Cross-sectional data is used from municipalities in Lombardia, and both a non-spatial OLS model as a spatial OLS model is applied. Control variables include the political orientation of the government, area size, number of inhabitants and income per capita. The size of the population seems important, since this control variable has a highly significant (negative) effect on the tax rate. The reason lies in economies of scale, which are also relevant for public services.

Brett & Pinkse (2000) find that municipalities in British Columbia (Canada) are responsive towards tax changes in neighbouring municipalities. They use four different concepts of neighbours and use instruments to account for endogenous variables. The instrument used for the total tax rate is the part of the tax rate that is set by an different entity than the municipality, in case the provincial government. Although they do not dive deep into yardstick competition, since they do not have the necessary data for that, they argue that yardstick competition is the most probable explanation of the patterns in the data they observe.

Fiva & Rattsø (2007) find similar results in Norway: they state that yardstick competition can explain certain geographic patterns in local property taxes. Their methodology is a bit different, since municipalities can choose whether or not they have a municipal property tax, so they study a discrete choice. A spatial error model and a spatial lag model are employed to study this discrete choice for Norwegian municipalities. Control variables are once again important. The likelihood of having a property tax decrease with average income, and ideological orientation of the local council is also relevant. The higher the share of socialist seats, the higher the chances that a property tax is installed.

A later paper by Besley & Case (1995) – more related to the political economy side of yardstick competition – finds that the chances for a US State governor to be re-elected decreases as state tax rates increase, but increases when neighbouring states increase their tax rates. Voters seem to compare their state to other states surrounding them. Their empirical approach uses changes in tax rates, since these changes are likely to capture shocks. Inhabitants then decide whether the tax change following the shock was appropriate. Furthermore, the chances of reelection are based on the expected value of future tax increases. Overidentifying restrictions of the two previous formulas are used to find the spatial correlation coefficient.

Vermeir & Heyndels (2006) and Revelli (2002) come to the same conclusion when studying yardstick competition in Belgian municipalities and English municipalities respectively. Vermeir & Heyndels (2006) use a vote function where the dependent variable is the percentage of vote for government parties. Yardstick competition is studies by including tax rates of neighbouring municipalities into the vote function. Both OLS regressions and two-stage least squares regressions with several instrumental variables - such as the area of the municipality, the number of inhabitants and the proportion of young and elderly people – for own tax rates. Revelli (2002) also uses OLS and instrumental variables to study the vote function. He uses the (twice) lagged observations of vote share, own tax rates and neighbours' tax rate and own and neighbours' demographics. These twice lagged observations can function as instrumental variables, since once lagged observations would cause an econometric challenge, since the lagged dependent variable would be correlated with the error term in a fixed effects model.

Bosch & Solé-Ollé (2007) find that property tax increases in Spain (at both municipal and neighbourhood level) have a non-negligible impact on the vote share of the incumbent politicians. They use a similar set up as Vermeir & Heyndels (2006) but add a variable the contains the vote share of the main party in the governing coalition, which is usually also the party of the mayor.

Studies by Małkowska et al. (2021) and Delgado & Mayor (2011) show that tax mimicking in local tax rates might be caused by political considerations. Małkowska et al. (2021) find evidence for yardstick competition in Poland, but also state that political trends and their influence of local tax rates differ significantly between different regions. They find these results using a fixed effects spatial autoregressive panel model. The spatial interaction is modelled by introducing lagged values of residential tax rates. This enables them to study whether there are any global spillover effects. Delgado & Mayor (2011) estimate a tax reaction function mainly using a spatial lag model and a spatial error model and find positive spatial autocorrelation for property taxes in Spain, but not for the motor vehicle tax. This might indicate that voters care less about the tax rate for motor vehicles than the politically more intriguing property tax rate, which is reflected in the behaviour of incumbent politicians towards these two taxes. Context and setting are important for the observed yardstick competition according to Schaltegger & Küttel (2002). They find that Swiss cantons with more direct democracy and fiscal autonomy are less engaged in tax policy mimicking. The underlying reason is that direct democracy and fiscal autonomy broaden the electoral competition. Therefore, the incentive to use tax rate competition for electoral reasons becomes smaller, reducing the amount of yardstick competition. Their methodology includes instrumental variables in the form of a matrix formed by a subset of fiscal and demographic variables.

The introduction of new taxes can also be related to yardstick competition and policy mimicking of municipalities. A study by Ashworth et al. (2006) looks into first adoptions of green taxes in municipalities in Belgium. They find that first adoptions are less likely to occur during election years (indicating that local policies can be influenced by electoral considerations). On the other hand, when neighbouring municipalities had already adopted the new green tax, the chances of adopting the new tax rose (indicating a certain amount of policy mimicking). They construct a discrete choice model, where one of the independent variables is the percentage of neighbours and the percentage of neighbours of neighbours with an environmental tax in the year before. Additionally, a variable measuring the ideological distance between neighbouring municipalities was used to check whether the political orientation of neighbours with a green tax affected the likelihood of adopting the green tax.

A fairly recent paper by Lopes da Fonseca (2017) provides quasi-experimental evidence for yardstick competition in the short run. She uses an exogenous policy change in local finances introducing a local business tax and applies a difference-in-differences methodology. The diff-in-diff is based on a difference in treatment intensity. Some municipalities already had experience with a local business surcharge. The treatment intensity for this group of municipalities is smaller than for municipalities for which the local business is completely new. She finds evidence for tax mimicking in the short run. The effect fades away after some time. She also identifies electoral concerns as the main driver of this tax mimicking in the short run. Politicians seem to use election results as information to confirm whether or not the electorate accepts their policies. This paper hints towards electoral concerns by politicians are the main driver of tax policy mimicking, but whether these concerns are valid is questionable.

The one and only empirical study in the context and setting of the Netherlands is almost twenty years ago. Allers & Elhorst (2005) study yardstick competition among Dutch municipalities a log-linear non-spatial model and several spatial models and find strong empirical evidence for tax mimicking. They find that, on average, a ten percent increase in the property tax rate in neighbouring municipalities leads to a 3.5 percent higher property tax rate. They find that the effect is lower when the governing coalition has a larger majority in the municipality council. In other words, when the threat of losing the majority at the next election is smaller, the tax mimicking effect is reduced.

In short, there can be different motives for tax mimicking behaviour. First, there can be electoral reasons why politicians tend to match the tax rates of nearby municipalities. Voters seem to compare tax rates of nearby jurisdictions to judge the incumbent politicians and their behaviour. Politicians anticipate on this judgement by changing tax rates, especially in years before elections. Alternatively, there can be policy incentives to match tax rates. If some surrounding municipalities already adopted a new tax, the policy incentive to also introduce this new tax becomes stronger. Municipalities might want a level-playing-field between firms of different municipalities.

3. Context and setting

Municipalities in the Netherland differ both in size and in inhabitants quite a lot. The biggest municipality in term of inhabitants is Amsterdam, with over 900.000 people within the municipality borders. Schiermonnikoog is the municipality with the lowest number of inhabitants: just under 1000 inhabitants.

The Netherlands has seen a reduction in its number of municipalities. Around a century ago, there were more than 1000, the current number (per 1-1-2023) is 342. Small municipalities are merged together to form one new municipality. To keep the dataset as complete as possible, former municipalities that were merged into another municipality will be in the dataset until the year that they have been merged with other municipalities. Newly formed or merged municipalities have elections to choose the members of the new municipality council. This is the only exception to the rule that all municipalities have once in four years their election.

The property tax for Dutch municipalities is the most important tax revenue for municipalities because it is the biggest source of revenue under direct control of the municipal council, although it only adds up to about 7% of the total income of municipalities (Kamerstukken II, 2022-2023, 36200 B, nr. 2). Other sources of income for municipalities are the national funds (roughly 50% of total income) and taxes that are levied to fund specific spending (for example the tax for garbage collection). The property tax collects about three quarters of non-earmarked own revenues.

The property tax has different categories with different rates. There are three types of municipal property taxes: one for owners of a house, one for owners of a non-house property, such as barns, shops, plants and commercial property and one for users/renters of a non-house property. The tax rate for houses usually between 0% and 0,2%, the rate for owners of non-house property is often higher, between 0,2% and 0,5%. The rate for users of non-house property is usually lower than for owners, and somewhere between 0,15% and 0,4%. In this thesis, only the tax rate for owners of a house will be used. So, every time 'tax rate', 'property tax rate' or any such combination of words is used, the tax rate for homeowners is meant.

An important aspect of the property tax is that you pay a percentage of the value of the building. Hence when house prices increase, the tax revenue would increase if the tax rate stayed the same, and vice versa. Some municipalities tend to set the tax rate in such a way that revenues stay roughly equal over the years, accounting for inflation only (Vereniging Eigen Huis, 2022). If that's the case, the tax rate decreases if house prices increase, and vice versa. This is taken into account by adding the average house price within a municipality as a control variable.

4. Data and Empirical Strategy

4.1 Variables and descriptive statistics

The data used for this thesis is gathered from different sources. The most important variable in this thesis is the tax rate for the property tax in Dutch municipalities. In this research, data on taxation levels between 2014 and 2022 will be used. This data is available via COELO, a Dutch Research Institute about the Economy of Decentral Governments. They study, among other things, the tax rates in provinces and municipalities, the way that decentral governments are funded by the central government and municipal policies regarding the housing market.

The tax rates for the tax rate for house owners are gathered using the database of COELO. Between 2014 and 2022, there have existed a total of 424 municipalities in the Netherlands. Newly formed or merged municipalities enter the dataset the year after the municipality was created. For municipalities that were merged into a new municipality, observations were used until the year they were merged. By handling the merging municipalities in this way, the dataset is as complete as possible. Dropping observations that are related to mergers would reduce the dataset by almost 50 percent and would mean that valuable observations would be lost. Additionally, there might occur a bias if merged municipalities and the tax rate would be correlated and merged municipalities would be dropped. It is well possible that this bias occurs. Since financial problems for municipalities can be a reason to merge, there might be correlation between financial problems and merging.

Financial problems are probably also correlated with the property tax rate, since that is the main instrument the municipal council can use to generate more income. That means there would be a correlation between the property tax rate and getting dropped from the dataset, which would bias our results.

4.1.1 Dependent and independent variables

The tax rate of the property tax is both the dependent variable as the independent variable, since this thesis looks at yardstick competition for municipal taxes. The tax rate of one municipality will be the independent variable for the tax rate of neighbouring municipality.

Municipalities that share a common border have been manually coded. Some municipalities share a common border with only two or three other municipalities, other municipalities share borders with up to eight other municipalities. If there is water in between two municipalities, they have been coded to border each other only if there was a bridge, dam or tunnel that connected the two municipalities. The five Wadden Islands have been coded such that they border each other and no other municipalities on the mainland. If municipalities merged into bigger municipalities during the period of interest, municipalities have been coded to border both the 'old' municipalities as the newly formed municipality.

4.1.1.1 The biggest neighbour

To limit the amount of time needed for preparing the data, the tax rate of the biggest neighbouring municipality has first been used as the independent variable, and not the average of the tax rate of all neighbouring municipalities. The biggest neighbouring municipality is defined as the municipality with the highest number of inhabitants. It is assumed that the biggest neighbouring municipality stays the same during the ten years included in this dataset. For municipalities that have been newly formed or merged during the timeframe of this research, the biggest neighbouring municipality has been defined as the municipality with the highest number of inhabitants in the year that the municipality entered the dataset. Using this technique to define the independent variable in the main regression formula has some limitations and drawbacks. The bigger municipalities now are more often the 'reference municipality' for surrounding municipalities. Second, using the average of all surrounding municipalities results in a more complete comparison. Tax rate changes in the second biggest neighbouring municipality are not taken into account using this method.

The choice to compare municipalities to their biggest neighbour seems a rather arbitrary choice. However, there are reasons to believe this is the best option when comparing municipalities to only one other municipality. Municipalities with more inhabitants will have more expertise among their workforce, and therefore perhaps a more advanced method to determine the optimal tax rate for their municipality. Given this expertise, smaller neighbouring might look to bigger neighbours what their tax rates for the next year will be and adjust their tax rates accordingly. Additionally, inhabitants of smaller municipalities probably have a higher likelihood of moving to bigger neighbouring municipalities than to smaller neighbouring municipalities. If yardstick competition is used to attract inhabitants and keep current inhabitants, it probably makes sense to compare to your biggest neighbour, when only comparing to one other municipality.

4.1.1.2 The provincial average

A second way to study yardstick competition is to simply compare municipalities within the same province. In this specification of the model, the same control variables and the same municipal property tax rate are used. The only difference is that the average of all other (so excluding the municipality of interest) municipalities within the same province is used as independent variable, instead of the property tax rate of the biggest neighbouring municipality. One other small difference is that the standard errors will be clustered at provincial level instead of at the level of the municipality.

Table 1: Descriptive Statistics

Variable	**Observations**	**Mean**	**Std. Dev.**	**Min**	**Max**
Tax rate	3,701	0.123	0.032	0.032	0.267
Average tax paid	3,701	329	99.18	116	1148
Inhabitants	3,701	46,587	70,786	919	918,117
Income	3,009	45,925	7,145	31,300	109,500
House price	3,338	297,834	105,683.8	119,488	1,118,894
Turnout	3,500	56.958	6.93	38.91	85.28

The tax rate shown in Table 1 is a percentage. The average of 0.123 means that the average tax rate over all municipalities in all years included in the dataset is 0.123%. The variation over municipalities (and over time) is quite large, given the minimum (Texel in 2023) of 0.032% and the maximum (Nijmegen in 2017) of 0.267%. The average tax paid (on annual basis) gives an idea of the size of the tax for households, although it differs between roughly 1150 euro

(Bloemendaal in 2023) and 116 euro (Texel in 2023). The average house price within the municipality plays a big role in the value of this variable.

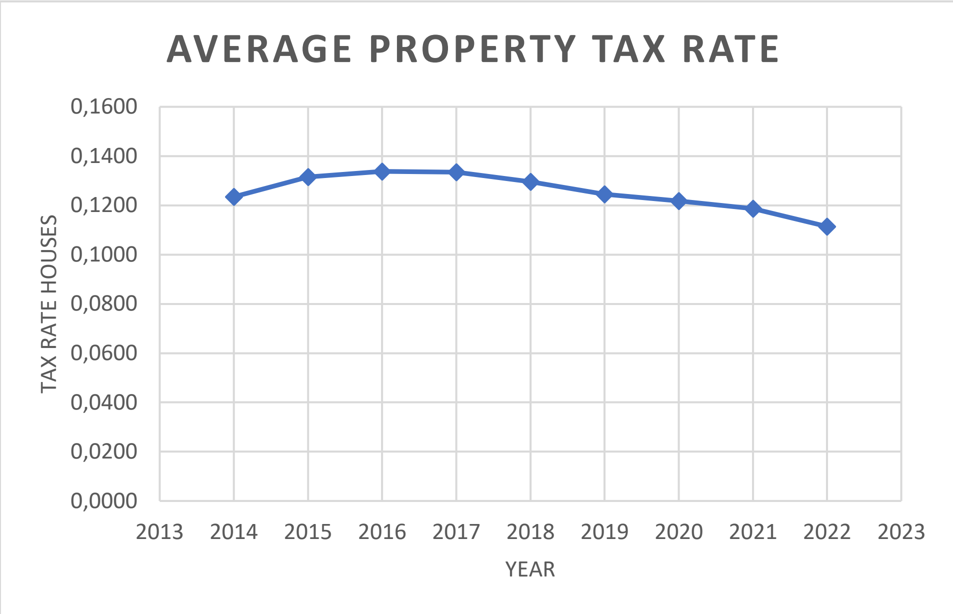

Figure 1: The average property tax rate for owners of houses in Dutch municipalities between 2014 and 2022

Since this thesis uses panel data from multiple years, it is also interesting to see how the variables have developed during the period under study, in this case between 2014 and 2022. First of all, the average tax rate for houses under the municipal property tax has increased during the first years but saw a decline in the more recent years. Figure 1 shows the development over the years of this variable in detail.

4.1.2 Control variables

The first control variable used is the number of inhabitants for each municipality in the time period between 2014 and 2022. The number of inhabitants says something about the size of the municipality, which might affect the property tax rate. Economies of scale affect the necessary tax rate, so the number of inhabitants should be a useful and necessary control variable to prevent omitted variable bias. The data for the number of inhabitants is retrieved using the database of CBS, the Dutch Central Bureau for Statistics. Over the years, we see a steady increase of the average number of inhabitants of municipalities. In 2014, the average number of inhabitants for a municipality was 41.683, while ten years later, this number increased with more than ten thousand to 52.080. Two reasons for this are population growth in general and the merging of several municipalities.

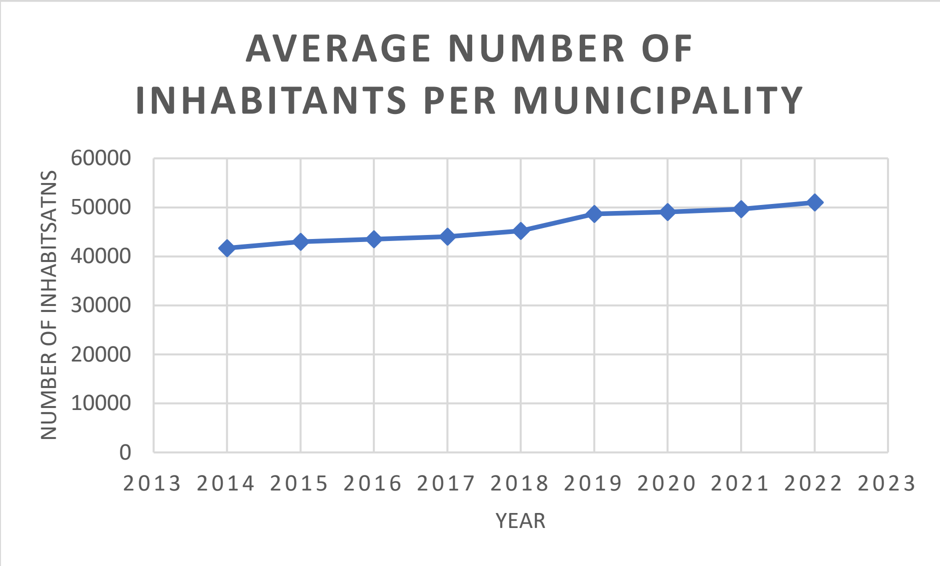

Figure 2: The average number of inhabitants per municipality in the Netherlands between 2014 and 2022.

Figure 2 shows the development of the average number of inhabitants per Dutch municipality. There is a clear increasing trend. This is due to two reasons. First, the merging of municipalities leads to bigger municipalities in terms of inhabitants. Second, the growth of the population in the Netherlands increases the total number of inhabitants in the Netherlands, so also the average number of inhabitants per municipality.

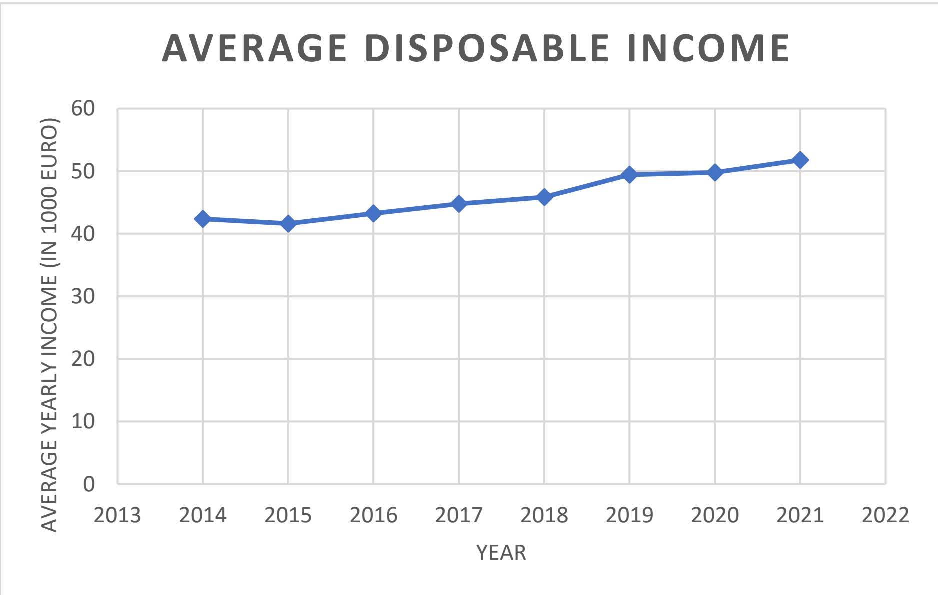

Figure 3: Average disposable income per household (in 1000 euros) in The Netherlands between 2014 and 2021

The second control variable is the average disposable income within the municipality. For this variable, the timeframe of observations is between 2014 and 2021. Information about the average disposable income in 2022 per municipality was not available via CBS, the source for all data on average disposable income per municipality in previous years. The average disposable income also rose with almost ten thousand euros, from just over 42.000 euros in 2014 to just under 52.000 euros in 2021.

The upward trend for the number of inhabitants is roughly similar to the upward trend of the average disposable household income, as shown in Figure 3. There was a small decrease of disposable household income between 2014 and 2015, but since 2015 there is a clear increasing trend. There was no available data for the average disposable household income per municipality in 2022, so the last year with data is 2021.

Given the tendency of some municipalities to compensate inhabitants for rising house prices by lowering the property tax rate, it is necessary to include house prices as a control variable. Average house prices per municipality are obtained via CBS for al years between 2014 and 2022. House prices have risen enormously since a decade ago. While in 2014, the average house price was 224.000 euros, in 2022 the average house price equals more than 431.000 euros. That means that the house prices have almost doubled in ten years. Since there are rumours that some municipalities use the property tax rate level to compensate for higher housing prices, you would expect to see the tax rates drop over the years.

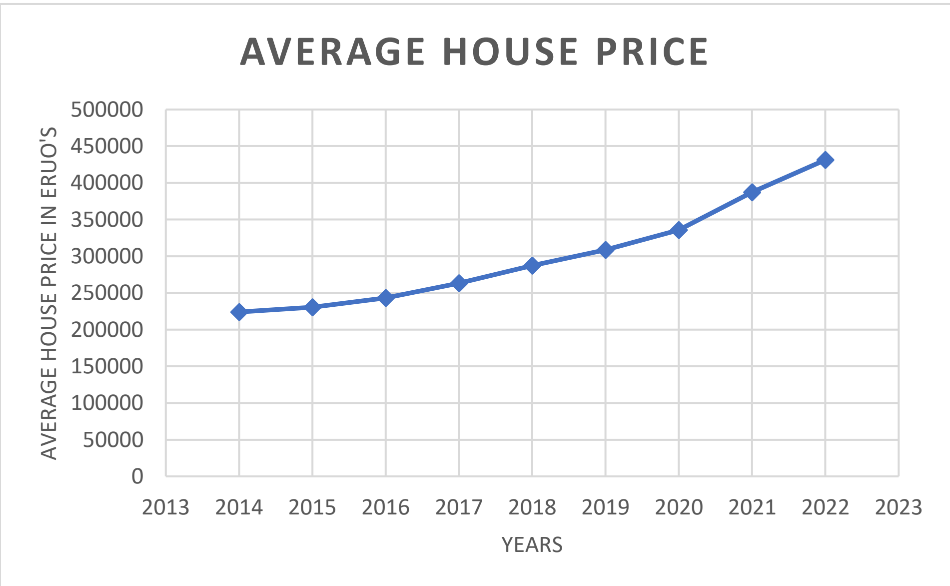

Figure 4: The average house price in euros per year between 2014 and 2022 in The Netherlands

Figure 4 shows the steepest trendline of the four figures discussed so far. In nine years, the average house price doubled from roughly 225.000 euros in 2014 towards almost 450.000 euros in 2022.

As a last control variable, the turnout at municipal elections is used. The turnout at municipal elections says something about how much (or: how less) attention inhabitants have for municipal politics. This might play a role in the considerations of the incumbent politicians when deciding on tax rates. In years that no municipal election took place, the election turnout of the last municipal elections is used. General municipal elections took place in 2014, 2018 and 2022. The average turnout in 2014 was 57,2%, compared to 58% in 2018 and 54,3% in 2022. The differences between municipalities are quite big, given the seven percentage points standard deviation, the minimum value of 39% and the maximum value of 85%.

4.2 Methodology

The methodology to study yardstick competition can go several ways. Some studies use instrumental variables (IV), others study the phenomenon with panel data making use of fixed effects models. Instrumental variables are often used to overcome confounding errors due to missing control variables. Examples of instrumental variables include the area of the municipality, the number of inhabitants and the proportion of young and elderly people (Revelli, 2002). The more advanced techniques are spatial autoregressive models, but these models are hard to understand and implement within the scope of a master thesis. Therefore, the research will use a standard OLS regression analysis with municipality and time fixed effects, where the tax rate in municipality m in year t will be the dependent variable, and the independent variable will be the weighted average tax rate in other municipalities in year t.

In addition, several control variables will be included in the regression analysis to obtain a better and more precise estimate. Control variables are added to the model to make the estimate more precise and to avoid omitted variable bias. Variables that effect both the tax rate of surrounding municipalities as the tax rate of the municipality of interest will bias the estimated effect if no control variable is added. Since the model includes fixed effects, only time-variant variables are relevant control variable. The fixed effects are used to control for all time-invariant differences between municipalities. Therefore, control variables that differ over time (time-variant) increase the internal validity of the research. Control variables that do not differ over time are not adding any additional value when used in a fixed effects model, since the fixed effects take away any difference caused by time-invariant variables.

Generally speaking, control variables that can be regarded as outcomes of the independent variable are seen as bad control variables (Angrist & Pischke, 2009). Some of the control variables used in this thesis, theoretically speaking, might be regarded as outcomes of the independent variable. The tax rate in municipality A for the 2023 is usually announced somewhere around the end of the summer in 2022. Therefore – again theoretically speaking – inhabitants of municipality B might notice this tax rate in municipality A and decide to relocate towards municipality A. That means that the number of inhabitants in 2023 in municipality B might be affected by the tax rate of municipality in in year 2023. In that way, the control variable is an outcome variable of the independent variable. Property tax levels might also affect house prices (Borge & Rattsø, 2014). House prices could thus be a bad control variable, since they can be regarded as an outcome of the independent variable (Angrist & Pischke, 2009). Bad controls can still be useful to add to the model if they proxy an important omitted variable. The number of inhabitants can be used as a proxy for the size of the municipality and house prices are still useful as a control variable because house prices are sometimes used by municipalities to set their property tax rates accordingly. Secondly, the argument that the number of inhabitants is an outcome of the tax rate in surrounding municipalities is highly theoretical.

4.2.1 Regression formula

The exact regression formula will be:

$$\tau_{mt} = \alpha + \beta\bar{\tau}_{mt} + \gamma X_{mt} + M_m + T_t + \varepsilon_{mt}$$

where τ_{mt} is the tax rate for the property tax in municipality *m* in year *t*, $\bar{\tau}_{mt}$ is the tax rate in other municipalities in year *t*. X_{mt} is a vector for control variables and local characteristics in municipality *m* and year *t*. The control variables are the number of inhabitants, the average disposable income, the average house price and the turnout at municipal elections. Two regression formulas have been used. One where $\bar{\tau}_{mt}$ is equal to the tax rate of the biggest neighbouring municipality in terms of inhabitants, and one where $\bar{\tau}_{mt}$ equals the average tax rate for all other municipalities within the same province. The results of both regression equations will be reported in chapter 5.

Both the dependent variable as the independent variable are tax rates, defined in percentage points. The interpretation of β is as follows. Assuming a β of 0.5, a tax rate increase of 0.02 percentage points (from 0.07% to 0.09%) in municipality A is associated with a 0.01 (0.5*0.02) percentage point increase in municipality B. In this case, municipality A is the biggest neighbouring municipality of municipality B. In the case where the average tax rate in the province is the independent variable, the interpretation is likewise. A 0.02 percentage point increase in the average tax rate for all municipalities within the same province is associated with a 0.01 percentage point increase in the tax rate of the municipality for which the tax rate is the dependent variable (again assuming a β of 0.5).

The interpretation of the regression coefficient β is relevant to answer the research question if and how the property tax rate in one municipality is affected by property tax rates in other (surrounding) municipalities. The bigger β, the bigger the influence of other municipalities' tax rates. If the results show a statistically and economically significant coefficient for β, and if there are no significant worries about biases, the answer to the research question is that the tax rate in one municipality is affected by tax rates in other municipalities by a non-insignificant amount.

5. Results

Chapter 5 shows the results of several regression equations and discusses these results in the context of statistical and economical significance and the theoretical and empirical literature on yardstick competition. Paragraph 5.1 discusses the results of the regression analysis with the average property tax rate of municipalities within the same province as the independent variable. Paragraph 5.2 shows the results of using the property tax rate of the biggest neighbouring municipality in terms of inhabitants as independent variable. Both paragraphs include a lag-structured model where the independent variable has been lagged once. Paragraph 5.3 shows the results for heterogeneous treatment effects for the number of inhabitants and the turnout at municipal elections.

5.1 Yardstick competition within the same province

Table 5.1 shows the results of the regression analysis with the property tax rate in municipality A is the dependent variable, and the average property tax rate in municipalities within the same province as municipality A as the independent variable. The table shows six different versions of the model, with differing control variables and differing standard errors. All versions of the model include fixed effects.

Table 5.1: Regression analysis results with the average tax rate in municipalities within the same province as independent variable

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Average Province	0.794***	0.843***	0.786***	0.772***	0.727***	0.727***
	(0.099)	(0.129)	(0.149)	(0.149)	(0.129)	(0.047)
Inhabitants					0.000**	0.000***
					(0.000)	(0.000)
Income				0.001	0.001*	0.001
				(0.001)	(0.001)	(0.001)
House prices			0.000	0.000	0.000*	0.000***
			(0.000)	(0.000)	(0.000)	(0.000)
Turnout		-0.003	-0.012	-0.036	-0.038	-0.038**
		(0.194)	(0.022)	(0.036)	(0.032)	(0.016)
Constant	0.03	0.02	0.04	0.05	0.09	0.09
R^2	0.55	0.55	0.41	0.36	0.38	0.38

Notes: Column 1 shows the results when not adding any control variables to the regression equations. Columns 2-5 show results with control variables, each column introduces a new control variable. Columns 1-5 use clustered robust standard errors on province level. Column 6 shows result with all control variables without clustered robust standard errors, using just robust standard errors without any clustering. Stars show statistical significance at 10% (*), 5% (**), and 1% (***). Standard errors are reported in parentheses. The reported value for R^2 is the within-observation R^2.

Column 1 of Table 5.1 shows a positive and statistically significant coefficient for the average property tax rate within the province. The size of the effect is estimated to be 0.794 and this estimated effect is statistically significant at the 1%-level. The interpretation of this estimated coefficient is that, all else equal, an increase of one percentage point in the average property tax rates of all other municipalities within the same province, is associated with an 0.769 percentage point increase in the municipal property tax rate.

Column 2 also shows a positive and statistically significant coefficient. Column 2 introduces the turnout at the last municipal elections as a control variable. Turnout at municipal election tells something about the political engagement of inhabitants of a municipality. As the theoretical and empirical literature has found that politicians tend to anticipate on the opinion of the electorate regarding the municipal tax rates (Lopes da

Fonseca, 2017), turnout is an important control variable to make the estimate more precise. The size of the effect increases to 0.843, which indicates that turnout at municipal elections does change the coefficient significantly.

Adding more control variables in column 3 (house prices), column 4 (average disposable income) and column 5 (number of inhabitants) again changes the estimated coefficient. The addition of the average disposable income of a municipality as a control variable seems to affect the estimated coefficient the least, while both the addition of house prices and the number of inhabitants reduces the estimated coefficient by roughly 0.06. The most complete version of the model, for which results are reported in column 5, estimates a positive and statistically significant effect of 0.727. This effect is significant at the 1%-level and is of great interest for politicians, voters, and policy makers. If this effect is the true effect, it learns them about the incentives that might be behind a tax rate increase or decrease. It could give arguments for politicians in election campaigns to use this information against incumbent politicians, and accuse them of strategic interaction when setting tax rates, instead of choosing the optimal tax rate for the local situation.

The theoretical argument behind taking the average tax rate of municipalities within the same province as independent variable is twofold. The first theoretical explanation relates to the spillover theory, where expenditures are similar for municipalities within the same province. Therefore, municipalities need a similar amount of tax revenues to pay for their expenditures, and subsequently, tax rates might be similar. Prerequisite for this theoretical argument is that municipalities within the same province are to a certain extent comparable in characteristics that affect municipal spending. Although some provinces might be regarded as more rural area and some as more urban area, the differences within provinces remain significant. So-called rural provinces such as Zeeland and Overijssel include municipalities with cities like Middelburg and Vlissingen for Zeeland and Enschede and Zwolle for Overijssel. On the other hand, so-called urban provinces like Zuid-Holland and Noord-Holland include rural municipalities such as Goeree-Overflakkee and Drechterland respectively. And even municipalities within the same province would be somewhat homogeneous, the municipal property tax only accounts for about 7% of income for municipalities (Kamerstukken II, 2022-2023, 36200 B, nr. 2). Therefore, this theoretical argument is unlikely to explain the mimicking of tax rates within the same province.

The second theoretical argument for tax rate mimicking within the same province is that voters might view property tax rates as a proxy for the performance of incumbent politicians of their municipality. This phenomenon is observed in the literature, even in The Netherlands specifically (Allers & Elhorst, 2005). They conclude that the size of the majority the governing coalition has, affects the size of tax mimicking by municipalities. This argument is a possible explanation for the estimated coefficients in Table 5.1, but with the data used in this thesis, it's not possible to check whether the size of the governing coalition affects the estimated coefficient. That would require additional data on the seats each party has in the municipal council and data on which parties are in the governing coalition.

To check whether there are heterogeneous treatment effects when turnout at municipal elections differs, sector 5.3.2. shows the results when including an interaction term with the effect of the surrounding municipalities and the turnout at the last municipal elections.

There might also be questions about the direction of the causality, since municipalities choose their tax rates for the next fiscal years simultaneously. Some municipalities might be early with choosing their tax rates, other municipalities might be later, but they all choose their tax rates within the same period of the year. It might therefore take time before tax rate changes in surrounding municipalities have an effect on the municipality in question. Therefore, Table 5.2 shows the results when the independent variable is the average tax rate of other municipalities within the same province (so excluding the municipality in question) the year before.

The results are interesting. The estimated effect of the average tax rates of municipalities within the same province the year before (so lagged once) is about half to a third of the estimated effect reported in Table 5.1, where the independent variable is not lagged. The effects are statistically significant on the 1%-level, just as in Table 5.1. There could be several contrasting explanations. On the one hand, the results could indicate that the effect in Table 5.1 is overestimated due to simultaneity with choosing the tax rates. On the other hand, it could also mean that there is an effect for both the lagged value and the tax rate in the same year.

Table 5.2: Regression analysis results with the average tax rate in municipalities within the same province in the previous year as independent variable

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Average Province in t-1	0.347***	0.313***	0.281***	0.255***	0.236***	0.236***
	(0.075)	(0.073)	(0.075)	(0.074)	(0.067)	(0.030)
Inhabitants					0.000***	0.000***
					(0.000)	(0.000)
Income				0.001	0.001	0.001
				(0.001)	(0.001)	(0.001)
House prices			0.000***	0.000***	0.000***	0.000***
			(0.000)	(0.000)	(0.000)	(0.000)
Turnout		-0.011	-0.019	-0.055*	-0.056**	-0.056**
		(0.015)	(0.018)	(0.025)	(0.020)	(0.017)*
Constant	0.09	0.10	0.12	0.14	0.18	0.18
R^2	0.52	0.52	0.38	0.30	0.33	0.33

Notes: Column 1 shows the results when not adding any control variables to the regression equations. Columns 2-5 show results with control variables, each column introduces a new control variable. Columns 1-5 use clustered robust standard errors on province level. Column 6 shows result with all control variables without clustered robust standard errors, using just robust standard errors without any clustering. Stars show statistical significance at 10% (*), 5% (**), and 1% (***). Standard errors are reported in parentheses. The reported value for R^2 is the within-observation R^2.

5.2 Yardstick competition with the biggest neighbour

Table 5.2 reports regression analysis results for a very similar model to the model used in paragraph 5.1. The only relevant difference between Table 5.1 and Table 5.2 is that the independent variable is different. Table 5.1 showed results with the average tax rate of municipalities within the same province as independent variable, Table 5.2 uses the tax rate of the biggest neighbouring municipality in terms of inhabitants as independent variable. The structure of the table is similar. Column 1 shows regression analysis results without adding any control variables to the model. Column 2, 3, 4 and 5 each add a control variable to the model, with the results in column 5 as the results of the full model. All specifications use fixed effects, column 1-5 use clustered robust standard errors at municipality level (different to Table 5.1

where standard errors were clustered at provincial level), column 6 shows results of the full model without clustered robust standard errors.

Table 5.3: Regression analysis result with the tax rate in the biggest neighbouring municipality in terms of inhabitants as independent variable

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Biggest Neighbour	0.045*	0.036	0.030	0.030	0.022	0.022**
	(0.025)	(0.027)	(0.026)	(0.028)	(0.027)	(0.010)
Inhabitants					0.000***	0.000***
					(0.000)	(0.000)
Income				0.001	0.001	0.001
				(0.001)	(0.001)	(0.001)
House prices			0.000***	0.000***	0.000***	0.000***
			(0.000)	(0.000)	(0.000)	(0.000)
Turnout		-0.017	-0.023	-0.061*	-0.062*	-0.062***
		(0.021)	(0.022)	(0.034)	(0.032)	(0.016)
Constant	0.11	0.13	0.14	0.17	0.20	0.21
R^2	0.50	0.51	0.36	0.29	0.31	0.31

Notes: Column 1 shows the results when not adding any control variables to the regression equations. Columns 2-5 show results with control variables, each column introduces a new control variable. Columns 1-5 use clustered robust standard errors on municipality level. Column 6 shows result with all control variables without clustered robust standard errors, using just robust standard errors without any clustering. Stars show statistical significance at 10% (*), 5% (**), and 1% (***). Standard errors are reported in parentheses. The reported value for R^2 is the within-observation R^2.

The results in Table 5.3 are very different from the results in Table 5.1. Only column 1 and column 6 report results with any statistical significance, at the 10%- and 5%-level respectively. The specifications in column 1 and column 6 are the worst specifications of the model, viewed from an econometric perspective. Not including any control variables while including them seems relevant and not clustering standard errors at the correct level are mistakes which bias the significance of the coefficients. These statistically significant results should therefore not be interpreted causally. In addition to that, the results reported in columns 2-5 should also not be interpreted causally, since these results are not statistically significant at 10%.

There might be several reasons why the regression analysis with the biggest neighbour as independent variable does not give any statistically significant results. There is no true null effect, but the confidence intervals are to big to conclude on what the relationship is. First, only using the property tax rate of the municipality with the most inhabitants probably is not the best method to study yardstick competition. It would be far better to include the tax rates of all surrounding municipalities, and maybe even attach different weights to municipalities based on their relevance to the municipality in question. Second, when using the tax rate of only one surrounding municipality, it could be that choosing the municipality with the highest number of inhabitants might not be the best method. Hypothetically speaking might it be better to compare one suburb of a bigger city with another suburb, than to the city, since these two municipalities might be a better comparison.

Some interesting estimates for the control variables need to be discussed as well. For the variables inhabitants, income and house prices, the estimated effect is approximately zero. For inhabitants and house prices this is an accurate null-effect, since the confidence intervals are very small. The effect of the average disposable income is also estimated to be around zero, but since the confidence interval is bigger, we cannot say anything about the true effect. Interestingly, in specification (4) and (5) the estimated coefficient for turnout at last municipal elections is statistically significant at the 10%-level. This varies from Table 5.1 where turnout is not statistically significant and average disposable income is, although only at the 10%-level, just like house prices. The number of inhabitants is statistically significant at the 5%-level in specification 5 of Table 5.1.

Table 5.4 below shows the results of regression analysis with the tax rate of the previous year of the biggest surrounding municipality. The results are not very different from the results reported in Table 5.3. The estimated effect when using the lagged value is a little bit smaller, but both results are not statistically significant, and the difference is also not statistically significant.

Table 5.4: Regression analysis results with the tax rate of the biggest neighbour (in terms of inhabitants) in the previous year as independent variable

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Biggest neighbour in t-1	0.038	0.028	0.028	0.024	0.018	0.018*
	(0.026)	(0.027)	(0.026)	(0.026)	(0.036)	(0.011)
Inhabitants					0.000**	0.000***
					(0.000)	(0.000)
Income				0.001	0.001	0.001
				(0.001)	(0.001)	(0.001)
House prices			0.000***	0.000***	0.000***	0.000***
			(0.000)	(0.000)	(0.000)	(0.000)
Turnout		-0.008	-0.016	-0.054*	-0.055*	-0.055***
		(0.019)	(0.020)	(0.031)	(0.030)	(0.017)
Constant	0.13	0.13	0.15	0.18	0.21	0.21
R^2	0.56	0.56	0.40	0.30	0.32	0.32

Notes: Column 1 shows the results when not adding any control variables to the regression equations. Columns 2-5 show results with control variables, each column introduces a new control variable. Columns 1-5 use clustered robust standard errors on province level. Column 6 shows result with all control variables without clustered robust standard errors, using just robust standard errors without any clustering. Stars show statistical significance at 10% (*), 5% (**), and 1% (***). Standard errors are reported in parentheses. The reported value for R^2 is the within-observation R^2.

5.3 Sensitivity analysis

5.3.1. Interaction term with the number of inhabitants

The number of inhabitants of a municipality might influence the treatment effect of yardstick competition. Incumbent politicians of smaller municipalities might be more reluctant to behave according to the yardstick competition theory, and copy tax setting behaviour of bigger municipalities around them. Voters might compare the small municipality to the bigger neighbouring municipality and judge incumbent politicians based on that comparison. Therefore, there could be heterogeneity in the treatment effects.

As a robustness analysis Table 5.1 and 5.2 have been replicated, but now they both include an interaction term between the independent variable and the number of inhabitants (in 1000s). Table 5.1 is replicated in Table 5.5 and Table 5.2 in Table 5.6 respectively. The estimated coefficient for the interaction term in Table 5.5 is negligible and very close to zero. The interpretation of the coefficient of interest changes by adding an interaction term. The coefficient for the independent variable now can be interpreted as the effect when the number of inhabitants is zero. The coefficient of interest has not changed significantly by adding the interaction term. Adding the interaction term with inhabitants is a method to study whether heterogeneous treatment effects occur. The coefficient of the interaction term (being very close to zero) tells us that there are no such heterogeneous treatment effects with regard to the size of the municipality in terms of inhabitants.

Table 5.5: Regression analysis results with the average tax rate in municipalities within the same province as independent variable plus an interaction term with the number of inhabitants

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Average Province	0.729***	0.778***	0.714***	0.714***	0.724***	0.724***
	(0.094)	(0.126)	(0.135)	(0.134)	(0.129)	(0.049)
Average	0.00	0.00	0.00	0.00	0.00	0.00
Province*Inhabitants	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Inhabitants					0.000***	0.000***
					(0.000)	(0.000)
Income				0.001	0.001	0.001
				(0.001)	(0.001)	(0.001)
House prices			0.000*	0.000**	0.000*	0.000***
			(0.000)	(0.000)	(0.000)	(0.000)
Turnout		-0.006	-0.013	-0.037	-0.038	-0.038
		(0.017)	(0.018)	(0.034)	(0.032)	(0.016)
Constant	0.03	0.02	0.04	0.05	0.09	0.09
R^2	0.55	0.56	0.42	0.36	0.38	0.38

Notes: Column 1 shows the results when not adding any control variables to the regression equations. Columns 2-5 show results with control variables, each column introduces a new control variable. Columns 1-5 use clustered robust standard errors on municipality level. Column 6 shows result with all control variables without clustered robust standard errors, using just robust standard errors without any clustering. All columns include an interaction term between the independent variable and the number of inhabitants (in 1000s). Stars show statistical *significance at 10% (*), 5% (**), and 1% (***).* Standard errors are reported in parentheses. The reported value for R^2 is the within-observation R^2.

In Table 5.6, there is one difference compared to Table 5.2 in terms of statistical significance. The estimated coefficient for the independent variable in column 1 is no longer statistically significant at the 10%-level in Table 5.6. This shows how barely significant this coefficient was in the first place. This difference is of no significance to the interpretation of the results.

Table 5.6: Regression analysis result with the average tax rate in the biggest neighbouring municipality in terms of inhabitants as independent variable plus an interaction term with number of inhabitants

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Biggest Neighbour	0.017	0.007	-0.002	-0.004	0.030	0.030**
	(0.032)	(0.033)	(0.032)	(0.033)	(0.027)	(0.013)
Biggest	0.00	0.00	0.00	0.00	0.00	0.00
Neighbour*Inhabitants	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Inhabitants					0.000***	0.000***
					(0.000)	(0.000)
Income				0.001	0.001	0.001
				(0.001)	(0.001)	(0.001)
House prices			0.000***	0.000***	0.000***	0.000***
			(0.000)	(0.000)	(0.000)	(0.000)
Turnout		-0.019	-0.026	-0.062*	-0.062*	-0.062***
		(0.021)	(0.022)	(0.033)	(0.033)	(0.017)
Constant	0.12	0.13	0.15	0.17	0.21	0.21
R^2	0.50	0.51	0.36	0.29	0.31	0.31

Notes: Column 1 shows the results when not adding any control variables to the regression equations. Columns 2-5 show results with control variables, each column introduces a new control variable. Columns 1-5 use clustered robust standard errors on municipality level. Column 6 shows result with all control variables without clustered robust standard errors, using just robust standard errors without any clustering. All columns include an interaction term between the independent variable and the number of inhabitants (in 1000s). Stars show statistical significance at 10% (*), 5% (**), and 1% (***). Standard errors are reported in parentheses. The reported value for R^2 is the within-observation R^2.

5.3.2. Interaction term with the turnout at the last municipal elections

In Table 5.5 and 5.6 instead of an interaction term with the number of inhabitants of a municipality, an interaction term with the turnout at the last municipal elections is included. Turnout at municipal elections could be a proxy variable for how invested inhabitants are in local politics. A higher turnout at elections could imply a better-informed average citizen about local politics, which would give an incentive to politicians to match tax rates with surrounding municipalities accordingly. Therefore, there is a chance that there are heterogeneous effects with turnout at the last elections.

<u>Table 5.7:</u> Regression analysis results with the average tax rate in municipalities within the same province as independent variable plus an interaction term with the turnout at the last municipal elections

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Average Province	1.001***	1.703***	1.687***	1.639***	1.387***	1.387***
	(0.130)	(0.312)	(0.381)	(0.451)	(0.379)	(0.203)
Average Province	-0.3015	-1.506***	-1.624**	-1.560*	-1.184	-1.184***
*Turnout	(0.169)	(0.474)	(0.591)	(0.732)	(0.666)	(0.353)
Inhabitants					0.000**	0.000***
					(0.000)	(0.000)
Income				0.001*	0.001	0.001
				(0.001)	(0.001)	(0.001)
House prices			0.000**	0.000**	0.000*	0.000***
			(0.000)	(0.000)	(0.000)	(0.000)
Turnout		0.177***	0.192**	0.168**	0.117*	0.117**
		(0.051)	(0.064)	(0.067)	(0.059)	(0.049)
Constant	0.02	-0.08	-0.07	-0.06	0.01	0.01
R^2	0.55	0.56	0.42	0.36	0.38	0.38

Notes: Column 1 shows the results when not adding any control variables to the regression equations. Columns 2-5 show results with control variables, each column introduces a new control variable. Columns 1-5 use clustered robust standard errors on municipality level. Column 6 shows result with all control variables without clustered robust standard errors, using just robust standard errors without any clustering. All columns include an interaction term between the independent variable and the turnout at the last municipal elections. Stars show statistical *significance at 10% (*), 5% (**), and 1% (***). Standard errors are reported in parentheses. The reported value for R^2 is the within-observation R^2.*

The results are rather unexpected. Table 5.7 shows some statistically significant results for the interaction term, but they imply that a higher turnout would lead to a smaller yardstick effect, while our theoretical argument suggests different results. In the most detailed version of the model, specification (5), the interaction term is not significant. There is obviously no true null effect, so additional research might be necessary to find out what the true relationship between turnout at municipal elections and yardstick competition is.

Table 5.8: Regression analysis result with the average tax rate in the biggest neighbouring municipality in terms of inhabitants as independent variable plus an interaction term with turnout at last municipal elections

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Biggest Neighbour	0.173*	0.239	0.215	0.129	0.051	0.051
	(0.097)	(0.153)	(0.160)	(0.185)	(0.171)	(0.084)
Biggest	-0.248	-0.366	-0.334	-0.179	-0.050	-0.050
Neighbour*Turnout	(0.151)	(0.244)	(0.256)	(0.303)	(0.279)	(0.151)
Inhabitants					0.000***	0.000***
					(0.000)	(0.000)
Income				0.001	0.001	0.001
				(0.001)	(0.001)	(0.001)
House prices			0.000***	0.000***	0.000***	0.000***
			(0.000)	(0.000)	(0.000)	(0.000)
Turnout		0.023	0.016	-0.038	-0.056	-0.056***
		(0.034)	(0.038)	(0.056)	(0.052)	(0.026)
Constant	0.12	0.11	0.12	0.15	0.21	0.21
R^2	0.51	0.51	0.36	0.29	0.31	0.31

Notes: Column 1 shows the results when not adding any control variables to the regression equations. Columns 2-5 show results with control variables, each column introduces a new control variable. Columns 1-5 use clustered robust standard errors on municipality level. Column 6 shows result with all control variables without clustered robust standard errors, using just robust standard errors without any clustering. All columns include an interaction term between the independent variable and the turnout at the last municipal elections. Stars show statistical *significance at 10% (*), 5% (**), and 1% (***). Standard errors are reported in parentheses. The reported value for R^2 is the within-observation R^2.*

Table 5.8 shows results when including an interaction term between turnout at the last municipal elections and the effect of the tax rate of the bigger neighbour (in terms of inhabitants). It does not really offer any valuable information, since there are no statistically significant coefficients that show an effect. House prices and the number of inhabitants once again show a true null effect.

6. Discussion

6.1 Omitted variable bias

When using regression analysis as the research technique, one potential downfall is that there are relevant variables that affect both the dependent variable as the independent variable. This could lead to an over- or underestimation of the actual effect, since the effect of the confounding variable will be included in the estimated relationship between the dependent and independent variable, if the confounding variable is not added to the model as a control variable. These confounding variables make the result less trustworthy. In the context of this thesis, there might also be confounding variables. If variables affect both the tax rate in municipality A as the tax rate of surrounding municipalities B, C and D, they should be added to the model. One of the main issues lies in the absence of any variables that describe the political situation within municipalities. From the empirical literature we know that incumbent politicians tend to set tax rates according to the public opinion in their municipality (Delgado & Mayor, 2011). We also know that inhabitants tend to judge the behaviour of their incumbent politicians at least partly based on the tax rates in their municipality, and they compare these tax rates with tax rates in neighbouring municipalities to be able to compare (Vermeir & Heyndels, 2006). The public opinion in municipality A probably affects the tax rate in municipality A, but it could also affect the tax rate in neighbouring municipality B if politicians in municipality B since Ashworth et al. (2006) found that the ideological distance between municipalities can play a role in yardstick competition. If a neighbouring municipality is ideologically closer by, the incentive for yardstick competition is bigger, since voters might compare municipalities that are ideologically closer to their own municipality.

6.2 Simultaneity and reversed causality

When choosing tax rates and anticipating on the tax rates of other municipalities, the timing of announcing the tax rates for next year is important. There are no strict rules in place for when a municipality should announce the tax rates for next year. Tax rates are set by the municipality council and usually proposed by the governing body. The uncertainty whether municipalities have been able to set their tax rates knowing the tax rates of the municipalities around them makes the results less reliable. That is why the results section also includes an analysis where we use lagged values for the average tax rate in the province and of the biggest neighbour. This model is also not a perfect fit for the situation, since municipalities might also adjust their tax rates for next year on the announced tax rates of other municipalities. The uncertainty of whether municipalities can take announced tax rates of other municipalities into account when deciding on their own tax rates makes both the results of the lagged values as the results of the non-lagged values questionable. Ideally, we would study a situation where all municipalities choose their tax rates on the exact same moment, without knowing anything about what other (neighbouring) municipalities might decide. That would allow us to use the lagged values and come up with results that are more trustworthy.

This also touches on a second concern with the results. There might be some reversed causality going on. If the tax rate of the municipality functioning as the dependent variable is announced before the tax rate of the municipality functioning as the independent variable, then the dependent variable might affect the independent variable. Therefore, the results should interpreted cautiously. In addition to this, house prices and inhabitants might be an outcome of the tax rate, although that argument is highly theoretical. But, it emphasizes that results should be handled with caution.

6.3 Policy implications

Although there are several reasons to doubt the results found in this study, there are still some implications that might be interesting for policymakers, politicians and voters. To be able to analyse elections, behaviour of politicians and behaviour of voters, it is optimal to have as much information as possible about the potential incentives someone has when choosing. The statistically significant results from Table 5.1 and 5.3 are of great importance for the policy field, if the results that are obtained reflect the true effect of yardstick competition.

Although these results should be interpreted with caution, it tells us that there might be political and electoral incentives to set the municipal property tax rate at a certain level.

These results are, although they differ in the size of the effect, in line with previous literature. If voters know that politicians anticipate on their comparison of tax rates to judge the performance of incumbent politicians, they might prioritize analysing other performances of local politicians to judge for whom they might want to vote. The results are also interesting for policymakers at municipalities. If they know their political bosses (aldermen) might have electoral incentives to set tax rates at a certain level, they might argue against it from a policy perspective.

The results can also be interesting when discussing whether municipalities should have more possibilities to levy taxes to increase their independence from money from the national funds. If the central government knows that municipalities might be affected by electoral concerns when setting tax rates, this might disincentive the central government to give municipalities more options for collecting taxes.

6.3 Further research

This thesis gives extra reasons for further research into the phenomenon of tax mimicking and yardstick competition with municipal tax rates. In the first place because of the interesting results of statistical and economical significance, but also because of the limitations of this thesis. Further research could be conducted by including political variables in the dataset, for example on the amount of seats the governing coalition has in the municipal council and in which year election take place. In addition to that, taking the average tax rate of all municipalities bordering the municipality in question might add valuable information about yardstick competition to the existing literature, especially when the municipalities are weighted for how relevant they are for other municipalities in determining the tax rate.

7. Conclusion

This thesis studies 424 Dutch municipalities over the period between 2014 and 2022 to investigate whether the property tax rate of municipality A is affected by the tax rates of other municipalities. A fixed effects model, with time and municipality fixed effects is used to answer the research question 'to what extent is the tax rate of the onroerendezaakbelasting (a Dutch municipal property tax) affected by the tax rates in other municipalities between 2014 and 2022?'. Several control variables have been added to the regression analysis to prevent a bias from confounding variables. Two variants of the model have been exploited, one where the average tax rate of municipalities within the same province was the independent variable, and one where the tax rate of the biggest neighbouring municipality was the independent variable.

The results are mixed. The first variant of the model as described above resulted in statistically significant results. Roughly speaking, a 1 percentage point increase in the average tax rate of other municipalities in the province is associated with a 0.6-0.8 percentage point increase in the property tax rate. The second variant of the model did not result in any significant results. The sensitivity analysis looked at whether there were heterogeneous treatment effects for the size of the municipality in terms of inhabitants. No such effects were found. The interaction term between voter turnout and the treatment variable gives statistically significant results in some specifications, but the sign of the effect is contrary to what was expected based on the underlying theory. In the most detailed specification, the interaction effect was not statistically significant.

There are several limitations to the results. First, there might be omitted variable bias, because no variables were used that describe the political situation in the municipality and in the municipal council. These variables might affect the results, given the empirical literature on this. Second, reverse causality cannot be ruled out, although the lagged model provides statistically significant results. Further research might be necessary to conclude whether yardstick competition between Dutch municipalities still exists. I recommend including political variables and use all surrounding municipalities instead of only the biggest neighbour. These additions could result in more precise estimations of the effect of one municipality's tax rate on other municipalities' tax rates.

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Appendix: All municipalities, categorized by province

Province	Municipalities
Groningen	Appingedam
	Bedum
	Bellingwedde
	De Marne
	Delfzijl
	Eemsdelta
	Eemsmond
	Groningen
	Grootegast
	Haren
	Het Hogeland
	Hoogezand-Sappemeer
	Leek
	Loppersum
	Marum
	Menterwolde
	Midden-Groningen
	Oldambt
	Pekela
	Slochteren
	Stadskanaal
	Ten Boer
	Veendam
	Vlagtwedde
	Westerkwartier
	Westerwolde
	Winsum
	Zuidhorn
Friesland	Achtkarspelen
	Ameland
	Dantumadiel
	De Fryske Marren
	Dongeradeel
	Ferwerderadiel
	Franekeradeel
	Harlingen
	Heerenveen
	het Bildt
	Kollumerland en Nieuwkruisland
	Leeuwarden
	Leeuwarderadeel
	Littenseradiel
	Menameradiel
	Noardeast-Fryslân
	Ooststellingwerf
	Opsterland
	Schiermonnikoog
	Smallingerland
	Súdwest Fryslân
	Terschelling
	Tytsjerksteradiel
	Vlieland
	Waadhoeke
	Weststellingwerf
Drenthe	Aa en Hunze
	Assen
	Borger-Odoorn
	Coevorden
	De Wolden
	Emmen
	Hoogeveen
	Meppel
	Midden-Drenthe
	Noordenveld
	Tynaarlo
	Westerveld
Overijsel	Almelo
	Borne
Overijsel	Dalfsen
	Deventer
	Dinkelland
	Enschede

	Haaksbergen Hardenberg Hellendoorn Hengelo Hof van Twente Kampen Losser Oldenzaal Olst-Wijhe Ommen Raalte Rijssen-Holten Staphorst Steenwijkerland Tubbergen Twenterand Wierden Zwartewaterland Zwolle
Gelderland	Aalten Apeldoorn Arnhem Barneveld Berg en Dal Berkelland Beuningen Bronckhorst Brummen Buren Culemborg Doesburg Doetinchem Druten Duiven Ede Elburg Epe Ermelo Geldermalsen Groesbeek Harderwijk Hattem Heerde Heumen Lingewaal Lingewaard Lochem Maasdriel Millingen aan de Rijn Montferland Neder-Betuwe Neerijnen Nijkerk Nijmegen Nunspeet Oldebroek Oost Gelre Oude IJsselstreek Overbetuwe Putten Renkum Rheden Rijnwaarden Rozendaal Scherpenzeel Tiel Ubbergen Voorst Wageningen West Betuwe West Maas en Waal Westervoort Wijchen Winterswijk Zaltbommel Zevenaar

	Zuthpen
Utrecht	Amersfoort Baarn Bunnik Bunschoten De Bilt De Ronde Venen Eemnes Houten IJsselstein Leusden Lopik Montfoort Nieuwegein Oudewater Renswoude Rhenen Soest Stichtse Vecht Utrecht Utrechtse Heuvelrug Veenendaal Vijfheerenlanden Wijk bij Duurstede Woerden Woudenberg Zeist
Noord Holland	Aalsmeer Alkmaar Amstelveen Amsterdam Beemster Bergen NH Beverwijk Blaricum Bloemendaal Bussem Castricum Den Helder Diemen Dijk en Waard Drechterland Edam-Volendam Enkhuizen Gooise Meren Graft-De Rijp Haarlem Haarlemmerliede en Spaarnwoude Haarlemmermeer Heemskerk Heemstede Heerhugowaard Heiloo Hilversum Hollands Kroon Hoorn Huizen Koggenland Landsmeer Langedijk Laren Medemblik Muiden Naarden Oostzaan Opmeer Ouder-Amstel Purmerend Schagen Schermer Stede Broec Texel Uitgeest Uithoorn Velsen Waterland

	Weesp Wijdemeren Wormerland Zaanstad Zandvoort Zeevang
Zuid Holland	Alblasserdam Albrandswaard Alphen a/d Rijn Barendrecht Bergambacht Bernisse Binnenmaas Bodegraven-Reeuwijk Brielle Capelle aan den IJssel Cromstrijen Delft Dordrecht Giessenlanden Goeree-Overflakkee Gorinchem Gouda Hardinxveld-Giessendam Hellevoetsluis Hendrik-Ido-Ambacht Hillegom Hoeksche Waard Kaag en Braassem Katwijk Korendijk Krimpen aan den IJssel Krimpenerwaard Lansingerland Leerdam Leiden Leiderdorp Leidschendam-Voorburg Lisse Maassluis Midden-Delfland Molenlanden Molenwaard Nederlek Nieuwkoop Nissewaard Noordwijk Noordwijkerhout Oegstgeest Oud-Beijerland Ouderkerk Papendrecht Pijnacker-Nootdorp Ridderkerk Rijswijk Rotterdam Schiedam Schoonhoven 's-Gravenhage Sliedrecht Strijen Teylingen Vianen Vlaardingen Vlist Voorne aan Zee Voorschoten Waddinxveen Wassenaar Westland Westvoorne Zederik Zoetermeer Zoeterwoude Zuidplas Zwijndrecht

Zeeland	Borsele Goes Hulst Kapelle Middelburg Noord-Beveland Reimerswaal Schouwen-Duiveland Sluis Terneuzen Tholen Veere Vlissingen
Brabant	Aalburg Alphen-Chaam Altena Asten Baarle-Nassau Bergeijk Bergen op Zoom Bernheze Best Bladel Boekel Boxmeer Boxtel Breda Cranendonck Cuijk Deurne Dongen Drimmelen Eersel Eindhoven Etten-Leur Geertruidenberg Geldrop-Mierlo Gemert-Bakel Gilze en Rijen Goirle Grave Haaren Halderberge Heeze-Leende Helmond Heusden Hilvarenbeek Laarbeek Land van Cuijk Landerd Loon op Zand Maasdonk Maashorst Meierijstad Mill en Sint Hubert Moerdijk Nuenen c.a. Oirschot Oisterwijk Oosterhout Oss Reusel- De Mierden Roosendaal Rucphen Schijndel 's-Hertogenbosch Sint Anthonis Sint-Michielsgestel Sint-Oedenrode Someren Son en Breugel Steenbergen Tilburg Uden Valkenswaard Veghel

	Veldhoven Vught Waalre Waalwijk Werkendam Woensdrecht Woudrichem Zundert
Limburg	Beek Beekdaelen Beesel Bergen L Brunssum Echt-Susteren Eijsden-Margraten Gennep Gulpen-Wittem Heerlen Horst aan de Maas Kerkrade Landgraaf Leudal Maasgouw Maastricht Meerssen Mook en Middelaar Nederweert Nuth Onderbanken Peel en Maas Roerdalen Roermond Schinnen Simpelveld Sittard-Geleen Stein Vaals Valkenburg aan de Geul Venlo Venray Voerendaal Weert
Flevoland	Almere Dronten Lelystad Noordoostpolder Urk Zeewolde