Erasmus University Rotterdam
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Bachelor Thesis (Economics)

Capitalization effects in the Netherlands

Estimating the effect of property tax rates on housing prices

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Abstract

This thesis estimates the capitalization effect across Dutch municipalities, by using a fixed effect model with the average housing prices and property tax rates as the main variables and the municipal spending per capita as a control variable. The data consists of these three variables for the years 2010 to 2018. With this data and a regression model including time fixed effect the main question: "*What effect does the Property Tax rate have on the average housing prices across Dutch municipalities?*" was answered. The results are in line with the existing literature and can be interpreted as follows. Every percent the property tax rate is changed, the average housing price changes with -0,1395 percent. The estimation is statistical significant at the one percent level. The estimation does have some threats due to the variables and possible reverse causality.

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1. Introduction

The housing market and specially the prices on the housing market have gone through the roof in the past years. Prices in April of this year were on average 7,7 percent higher than the same month a year earlier (CBS, 2019). Economists have yet to agree what the reason of this growth could be. One of the main drivers of the housing prices according to Tsatsaronis & Zhu (2004) is inflation and the nominal interest rate. Experts agree that the increase of the housing prices in the Netherlands is also heavily caused by the shortage in supply on the housing market (ABN Amro, 2019). In addition to that, having the lowest interest rates in decades makes it less expensive to get a mortgage on a house, with an interest rate below 2% the last couple of years. This makes the demand for houses even bigger, but the amount of houses being constant in the short term, which also has an increase in average prices as a result.

Although the Netherlands is quite a small country, there is actually a significant difference in average housing prices within the country. The difference between the cheapest municipality on average and the most expensive municipality on average is even bigger than ever (CBS, 2019). Where the most expensive municipality is *Blaricum*, with an average selling price of a house of €902.200 in 2018 and the cheapest municipality is *Delfzijl* with an average price of €142.200 in 2018. A difference of €760.000. This difference is an outlier, since 80 percent of all municipalities lie between €210.700 and €371.600 when it comes to the average selling price of a house in 2018 (CBS, 2019).

One of the things that differs between municipalities in the Netherlands is the property tax rate. Whereas there has a lot of research been done on the effect of property tax on housing prices worldwide, this kind of research has yet to be done in the Netherlands.

In the Netherlands one who owns a house has to pay property taxes. It was introduced in 1975 to replace the personal and land taxes that applied until then. With the introduction in 1975 it was made clear that the property tax was not to be used as a tool to get a balancing budget.

The property tax rate differs across municipalities and changes almost every year. The municipalities get about 1/6th of their income out of taxes, and big part of that, around 50% is from the property tax (CBS, 2018). In 2018 all municipalities combined raised around 4 billion euros in property taxes (CBS, 2018). The rest of the income from taxes came from i.e. sewage, parking and cleaning charges. The difference between charges and taxes is that the charges

can only be set as high as the costs they need to cover. A municipality can therefore only charge their citizens for the amount that the sewage for example will cost on estimate. This is different for the taxes, for which the property tax is the largest. A municipality can set their own property tax rate regardless of any potential costs. Even though it is not allowed, some municipalities use the property tax as a tool to get a balancing budget (Reijn, 2018), this would mean that not the property tax rates affect the prices, but the other way around. That when the prices go down for example, the municipality has to increase the tax rate to generate enough tax revenue. Despite municipalities might just use their property tax rate to get more income, the question arises if by doing that, a municipality influences the average housing prices. This is called capitalization. Future tax liabilities can be capitalized in the housing prices, to compensate these future tax expenses. To research the existence of this effect, the following question should be answered:

What effect does the Property Tax rate have on the average housing prices across Dutch municipalities?

If the effect would be positive it would mean that if the property tax rates increase, the housing prices increase with them. In case of a negative effect, an increase in property tax rate would result in a decrease in housing prices. Almost all relevant literature regarding property tax capitalization find a negative effect of property tax rates on housing prices. Thus, if the tax rate were to increase, the housing price will decrease to compensate the extra tax expenses in the future.

This thesis uses a panel data set with data on all Dutch municipalities between 2010 to 2018 regarding property tax rates, average housing prices and local expenditures. It uses a fixed effect model to estimate the capitalization effect.

With this fixed effect model is estimated that if the property tax rate increases in a municipality by 1%, the average housing price decreases by 0,1395%. This estimation is in line with written literature, although it seems that in absolute numbers there is overcapitalization.

The effect is negative, but not for all types of municipalities. If one divides the municipalities by height of property tax rate, one finds that the negative effect becomes positive in the municipalities with a high initial tax rate. The estimated effect of -0,1395 seems

to come from the average range of property tax rates, being between 0,051% and 0,15%. Further there are some robustness checks carried out to test the reliability of the estimation.

The structure of the thesis will be as follows. In section 2 the theoretical framework will be described, which will be used as a base to the model that will be built in section 4, after the data description in section 3. The results will be described in section 5 and will be discussed in section 6. The last section, section 7, will contain the conclusion.

2. Theoretical Framework

Literature on the capitalization of property tax is spread widely in different use of methods and different results. In this part the most important related literature will be presented in section 2.1 and will be used as the base of the model that will be built for this research. Section 2.2 will discuss the literature regarding the tax incidence of property taxes.

2.1 Tax capitalization

Yinger et all (1988) give a clear description for the definition of property tax capitalization. It states that property tax capitalization occurs when, *ceteris paribus*, an increase in property tax leads to a decrease in house value. Full capitalization means that every dollar the property tax increases, the value of the house decreases by that same dollar. This theory is again based on the Tiebout hypothesis (1956).

Therefore, tax capitalization is in essence the change of the value of an asset when the cash flow increases or decreases due to tax liabilities for that asset. So, in what extend an extra dollar in future tax liabilities influences the price. In case of houses that means that if a tax is increased by a dollar, the capitalization effect is in what extend that dollar is calculated into the price of the house. The mechanism underlying the theory of capitalization can be explained as follows. If the tax rate would increase, the amount in dollars of the tax would also increase. This means the future income would decrease, resulting in a lower present value of the decreased cash flow. This decrease of present value would be integrated into the original value of the asset.

The first notion of property tax capitalization was established by Oates (1969). He stated that full capitalization occurs if, after controlling for all differences in housing characteristics, the housing prices will differ exactly as much as the change in expect tax liabilities. To conduct this research into property tax capitalization, Oates used the theory which was described by Charles Tiebout in *"A pure theory of local expenditures"*. He was the first to describe a positive political theory regarding the sorting of individuals with respect to public goods preferences in 1956. The theory implies that competition across jurisdictional places will result in the sorting of individuals to their personal preferences of public services. Individuals will seek their optimal jurisdiction with a certain public service level, which is affected by the taxes that are paid, including the property tax.

Oates (1969) conducts a cross-sectional analysis to estimate the capitalization effect in the New York metropolitan area. In the regression the home value is the dependent variable. The independent variable which will estimate the capitalization effect is the property tax rate. He uses the effective property tax instead of the nominal rate, because the actual rate is not likely to have a systematic relationship with the nominal tax rate. This effective tax rate is calculated by multiplying the nominal rate and the assessment ratio (which is the ratio between the assessed value of a property and the market value of it). Some control variables are added with one of particular interest. The quality of public goods is, as described by Tiebout (1958), can have large effects on the property values. To measure this quality Oates uses the expenditures on primary and secondary education per pupil per year. By conducting both an ordinary least squares (OLS) and a two stage least squares (TSLS), he finds almost the same results. The property tax rate affects the property value negatively. He finds that almost two-thirds of a tax increase is capitalized into the property values. He also implies, because of his measurement of quality of public goods, that when a jurisdiction was to raise their property taxes and uses that extra income to improve the schooling they can offset the negative effect of the higher property tax on the property values.

In a later research Oates (1973) replied on comments that were made about his research in 1969. He perfected his model after his use of the proxy for quality of public goods was questioned. Instead of only using the expenditures on primary and secondary education he also included total expenditures per capita (with exception of spending on schooling and debt service). With the addition of this variable he again conducts a OLS and a TSLS. He finds two interesting effects with the addition of non-school spending. First, the estimated coefficient of the property tax increases in absolute numbers, suggesting that there indeed did exist a positive correlation between the non-school spending and the tax rate. Secondly, the estimated effect of non-school spending is significant, implying that public services other than education have an impact on property values. In the TSLS estimation, the coefficients are even higher, implying roughly full capitalization instead of the capitalization of two-thirds in the study in 1969.

After the publication of this research a large number of empirical studies were conducted following Oates's study. The majority of these studies documented that values of properties are negatively affected by expected tax liabilities.

Chinloy (1978), for example, used the effective tax rate instead of the real tax rate to estimate the capitalization effect. He states that using the actual tax rate will lead to a biased estimation of the capitalization if the tax rebates are not distributed the same way as the property tax itself. This effective tax rate is calculated by taking the effective average property tax (θ) from the data and subtract that with the tax credit divided by the market selling price of a house (*k*). Using a two stage least squares, where in the first stage θ and *k* were regressed on a couple of instruments. In the second stage these fitted values were used as independent variables and regressed on the dependent variable, the logarithm of selling price. Chinloy finds a big difference between using the actual tax rate and the effective tax rate. Calculating the capitalization effect by using the actual property tax rate, he finds that an increase in property tax rate of 1 percent results in a decrease in selling price by 5.8 percent. In contrary to that, when using the effective tax rate, the coefficient drops down to -0,45 percent, but most importantly is not significant at the 5 percent level. Implying that there is no capitalization effect for property tax and that using the actual property tax rate give an upward bias.

King (1977) suggest a different equation to estimate the capitalization of property tax than Oates. He believes the method Oates overestimated the magnitude of property tax capitalization, because the equation used by Oates suggested capitalization based on the tax rate, while the Tiebout hypothesis suggests capitalization of the tax burden.

$$V - btV = \beta_0 + \sum \beta_i X_i + \sum \beta_j P_j \quad (1)$$

Equation 1 was used by King to estimate the capitalization. Where V is the market value of the property, t represents the property tax rate, X_i is the physical attributes of property tax and P_j is the measure of public services. The variable *b* measures capitalization of the property tax liabilities into the property value.

Reinhard (1981) elaborates on this same method of King, but addresses two econometric errors. First, he addresses that the sign of *b* should be positive instead of negative. Although the expected sign is negative in the conventional formula, since (*-btV)* is subtracted from both sides of the equation, the sign should be positive. This means that the redefined dependent variable represents the hypothetical property value if there were no property taxes, but the level of public services was the same as before. This value should evidently be larger than V. The second econometric error, according to Reinhard, is that King

suggest the capitalization of the tax liability of only 1 year. Where the Tiebout hypothesis suggests that the future tax liabilities have to be discounted to the present value. Hence, the term *btV* should be revised to reflect the appropriate discount rate, r. When correcting for these two econometric errors, Reinhard comes up with this equation:

$$V + \frac{btV}{r} = \beta_0 + \sum \beta_i X_i + \sum \beta_j P_j \quad (2a)$$

Which can be rewritten into the following equation (this to make it possible to do a valid comparison of the R^2 across the equations):

$$V = \frac{\beta_0 + \sum \beta_i X_i + \sum \beta_j P_j}{[1+(bt/r)]} \quad (2b)$$

As mentioned before, Oates (1969 and 1973) estimated a capitalization of 66 and 92 percent, respectively. King estimated the capitalization effect by using the equation (1) at 63 and 67 percent respectively. Finally, after correcting the econometric errors of King's equation, Reinhard uses equation (2b) to estimate the capitalization at 100 percent and 140 percent, respectively. Hence, While King suggests that Oates' overestimates the capitalization due to the misspecification of the property tax term, Reinhard concludes that, due to econometric errors, both Oates and King underestimated the magnitude of capitalization.

Palmon & Smith (1998) summarize the past empirical analysis into two different models. The studies use either amenity or capitalization models. In an amenity model, the property tax rate is treated as one of several factors (amenities) affecting property or home values. On the other studies a capitalization model is used, in this model the current value of a home is assumed to be the present value of net benefits generated to the home owners (Palmon & Smith, 1988). The amenity model usually takes a form such as

$$P_j = \beta_0 + \sum \beta_i Z_{ij} + \beta_\tau \tau_j \quad (3)$$

Where P_j represents the value of property *j*, Z_{ij} are the neighbourhood specific characteristics, for example measures of public services and τ is the applicable property tax rate on property *j*. In this kind of model the coefficient β_τ is the estimated effect of a change in the annual

property tax rate on a property value. The model used by Palmon & Smith themselves (1998) is the capitalization model, which has ordinarily the following form:

$$P_j = \frac{S(Z_{ij})}{\bar{\rho}_n + \beta_\tau \tau_j} \quad (4)$$

where $\bar{\rho}_n$ represents the net user cost of housing, and $S(Z_{ij})$ is a hedonic function of the rental value of housing, which can be seen as the return received by a landlord when renting the property under a lease.

They use the capitalization model as displayed by equation (4). The hedonic function of the rental value of housing was specified as an exponential function of property specific characteristics. Such as amount of bathrooms and size of the property in square feet. The capitalization rate itself was specified as $\rho = \rho_n + \beta_\tau$. For ρ_n they use a fixed value of 0.03 (3 percent), following Yinger et al. (1988), to make it easier to compare the results with similar analysis in earlier studies. The results were obtained by using a nonlinear maximum likelihood algorithm. Palmon and Smith find a capitalization rate of 62 percent. Meaning that 62 percent of the change in property tax is capitalized into the house prices. This estimation is not in line with the majority of studies that were carried out before. Earlier studies found either no to little or full to over capitalization. This difference might come from the fact that the model that is used is heavily threatened by endogeneity issues. In this specific model Palmon and Smith expose one possible endogeneity issue and a possible measurement problem.

The possible endogeneity problem is the possible correlation between unexplained or unobserved variation in the Z_{ij} and the tax rate τ_j. To illustrate this, take the following example is taken into account. Let public services be Z_s, and assume that the measures are imperfect. This splits Z_s into two components: $Z_s = Z_m + Z_u$, whit Z_m being measured correctly and Z_u being unobserved. In addition, suppose that Z_s and τ are positively correlated (a higher tax rate generates higher tax income which makes it possible to pay for greater services). By using Z_m to control for variation in public services in either equation (3) or (4), the unobserved component Z_u, is going to be positively correlated with τ_j causing the estimation of β_τ to be biased downward (Palmon & Smith, 1998). A possible strategy to control for this threat is to obtain more detailed information about public services or to make the sample observations more comparable by reducing the variation in public services between jurisdictions. These two

strategies were used by Oates when responding to criticism about his 1969 paper. Yet, because of the difficulty of measuring all details of public services, the first strategy is expected to only partially solve the problem. The second strategy is also very difficult to apply, because of the lack of data regarding the housing markets that do have variation in tax rates and do not vary in services.

The potential measurement problem comes from the fact that jurisdiction often use the assessed value of a property to set tax rates, which affects the effective tax (which is the ratio of actual tax payed to market value of the property). The way of assessment might vary across jurisdictions and over time, this would lead to errors in variables and makes it hard to estimate the results. This potential problem can be overcome by using a sample that has the assessed values close to the market values of properties.

More recent studies find results that are inconsistent with the capitalization theory described before. Bradley (2015) estimates the capitalization by using sales and assessment data from Ann Arbor, a city located in Michigan for the period 1997 to 2007. He exploits the fact that differences in property tax liabilities are temporarily inherited by new homebuyers. Since the passing of legislation in 1994, local authorities can rise the taxable value if this taxable value is lying far below the assessment current market value, which are the result of capping the growth of this taxable value in years that there was no change in ownership of that property. As a consequence, properties with the same assessed value, might have a substantially different taxable value. Adding to this that taxable values are reset only once a year on the first of January, results that homebuyers have a temporary tax saving in the year of purchase, which is followed the next year by a permanent step up in tax liability (Bradley, 2015). By taking advantage of the mechanical relationship between the temporary tax saving and the amount of years that a property does not change ownership, makes it possible for the use of an instrumental variable (IV), which solves the possible endogeneity issues. By using a IV model with the level of state equalized value, that prevailed in the year that a property was bought, rescaled by intervening growth in assessed value as the instrument; Bradley (2015) finds that individuals overvalue a temporary decrease in property tax, increasing the housing price with a larger magnitude than the initial decrease in future taxes. He estimates that individuals, on average, pay $10,000 more than the present net worth of the tax rebate.

In addition to this, Lutz (2015) focusses on how the quantity of homes change with different fiscal amenities across communities. He uses a unusual reform of school finance in

the state of New Hampshire, which ended up being used to fund a property tax reduction. This negative shock is used to make an empirical analysis of the relationship between tax burdens and building activity. His results suggest that the supply of houses is substantially sensitive to property tax liabilities. A community receiving 15 percent of its local property tax revenue in the form of a grant, experienced an 11 to 22 percent increase in the investments in residential housing. This implies an elasticity of roughly -1.

Elinder and Persson (2017) take advantage of a national tax reform in Sweden to conduct a study on the effect of property tax on housing prices. They state that the research about property tax capitalization usually suffers from two identification problems. The first one being the fact that higher property tax revenues can result in a higher quality of public services due to the higher spending on it. Controlling for the quality of public services has been proven to be a very difficult task. Secondly, if a jurisdiction consists of high value properties only, it is possible to set a lower tax rate to get the same revenue as a jurisdiction with low value properties and a high tax rate. This can cause for a simultaneity bias between property tax rate and housing prices. The big difference to other researches is that in Sweden the property tax rate is set on national level, without local government having a say in it and thus without concern of local public services. The property tax reform allows to use a difference-in-difference (DiD) design to estimate the effect of property tax on housing prices. Taxable property values were not changed between 2006 and 2009 and are thus unaffected by any price change due to the tax reform, which was implemented in 2008. They use a DiD design with the properties lower than the cut-off of the reform as the counterfactual. They found no change in prices for the vast majority of the properties after the tax reform. Most of the houses in the treatment group show the same trend as the control group. It only seems to have had an effect on the highest valued properties. The top one percent of properties by value had an 8.4 percentage points increase in price relative to the control group. Although this seems to be a big effect, it is substantially lower than their expected price response being 16.0 percentage points.

2.2 Tax incidence

To estimate this capitalization effect, it is important to get an understanding of the incidence of property tax. In other words, who pays the taxes. Tax incidence has two kind of interpretations. The *statutory tax burden* describes who pays the tax according to the law. For

example, the law states that in the Netherlands, the owner of a house has to pay the property taxes. The *economic tax burden* on the other hand describes who really carries the weight of the taxes. It is possible that the economic and the statutory tax burden cannot be allocated to the same individual. To result in a correct conclusion, it is much more interesting to know who carries the *economic tax burden* than is to know who carries the *statutory tax burden*. Because for e.g. policy implications, it is necessary to know who actually bears the taxes and less interesting to know who pays the taxes according to the law.

The literature regarding the incidence of property tax can be divided into three different views; the 'old' view, the benefit view and the 'new' view. These three views will be described and summarized to get a clear picture of the different thoughts economists have on the incidence of property.

The first view is called the old view, or the traditional view. The traditional view is generally linked to Simon (1943), but it dates back to Edgworth who described the theory in 1897. Simon analysed the property tax by using a partial equilibrium approach, primarily focussing on the effect of an increase in the tax on the local housing market. He makes the standard assumption that the return on national capital is fixed. One can say that this implies that, because in the long run capital migrates from the jurisdiction until the after-tax local capital return equals the capital return on national level, the local capital does not bear any of the tax burden. This means that the burden is carried by the consumers and/or other local factors. The traditional view implies that this tax burden is entirely carried by the consumers of housing in the form of higher housing prices. This makes the property tax somewhat regressive, because housing expenditures are a large proportion of low income households Simon (1943).

The second view, is called the benefit view and was introduced by Hamilton (1975). This theory actually argues that the property tax is not a tax at all. It is an extension of the theory set by Tiebout (1956), which argues that in the case of perfect mobility, individuals will move across jurisdictions to maximize their preferences for public goods. Hamilton assumes that there are enough different public service packages to fit all individuals' preferences. Moreover, individual mobile tax payers would not accept to live in jurisdictions where the charges of taxes are higher than the value of its local public goods. The tax payed is thus, in Hamilton's perspective, a voluntary price for public services and can therefore not be seen as a tax. The two main implications of Hamilton's benefit view are compelling. First, this theory

suggests that the property tax is actually a user charge that home owners pay for local public services, making it a non-distortionary tax (because of the assumption Hamilton makes about homogenous house values). Secondly, with the view that it is a benefit tax, the property tax does not change the distribution of income.

The third and last view is the 'new' view, or the capital tax view. It was first developed by Mieszkowski (1972). He underlined that the use of the earlier mentioned partial equilibrium analysis used by the traditional view, was vastly misleading because they ignored the fact that property tax was used in almost all the local jurisdictions. He argues that property tax is in fact distortionary on the local use of capital, which leads to misallocation of the national capital stock across jurisdictions. He analysed the property tax by using the Harberger general equilibrium model of tax incidence. He described the economy having two types of jurisdiction. On the one hand, there were the jurisdictions with a high tax rate, on the other hand there were the jurisdictions with a low tax rate. With this in mind, Mieszkwoski showed that if the property tax rate would exceed the average of the country, it would drive capital out of this high tax jurisdiction into the relatively low tax jurisdictions. This implies that differences in property tax result in an inefficient allocation of capital. The average burden of the total of the property tax imposed nationwide (also known as the profit tax effect of the tax) is generally carried by the capital owners. This profit tax effect implies progressivity of the property tax, contrasting with the other two views on the property tax incidence. Mieszkowski also stresses that there will be excise tax effects as a result of the tax differentials. This excise tax effects are displayed in increase in housing prices and land price declines in high tax jurisdictions, vice versa for the low tax jurisdictions. Hence, from a national perspective these two effects cancel each other out, thus making the distributional effect of this excise tax effects secondary. The primary factor affecting the distribution of the property tax burden, according to the benefit view, is the profits tax effect.

Economists have yet to reach a conclusion about the incidence of property tax. Although there has been found some empirical evidence to support the benefit view, it is argued that the assumptions made in those empirical findings are lacking theoretical foundation (Aaron, 1974). Because there is no clear evidence on one view of property tax incidence, this thesis will not focus primarily on one of the views, but rather discuss all three of the views in the conclusion.

3. Data

The data used for this research consists of a dependent variable, a main independent variable and a control variable. These three variables will be discussed in this data section.

3.1 Dependent variable

The dependent variable is the average housing price. The data on the average housing prices come from the database of the CBS and consists of the average selling price of a house per municipality per year. Due to the lack of data before 2010, the years that are included in the sample are from 2010 to 2018, resulting in 9 years of data. The average housing prices are measured by the total sales revenue per municipality divided by the amount of houses sold by that municipality. Some municipalities have merged within these years. If two municipalities merged, the average of these municipalities was taken by adding up the average prices per year and divide them by the amount of municipalities that merged. The average selling price of a house in the Netherlands did increase between 2010 and 2018, but as can be seen in table 1, between 2011 and 2013 the average selling price per house actually decreased. It is likely that this is result of the lack of control for house quality, as mentioned above. This could lead to a selection bias which will be further elaborated in the discussion.

Table 1
Descriptive Statistics of Average housing prices (in euros)

Year	Observations	Mean	Std. Dev.	Min.	Max.
2010	354	253290	70275	132302	788688
2011	354	251261	70960	132951	775402
2012	354	236477	63475	136112	761560
2013	354	220858	59191	123208	609767
2014	354	225198	55421	119488	558336
2015	354	232760	59313	124837	597694
2016	354	246066	63766	127804	649703
2017	354	266434	72827	140643	775770
2018	353	289787	83794	142173	902214
Total	3185	246890	70124	119488	902214

3.2 Main independent variable

The second main variable is the property tax rate. Which can be set every year by a municipality. The property tax rates were obtained from database of the COELO (Centre for research on the economics of local governments). The property tax a house owner has to pay in a certain year depends on two things; the property tax rate of that year and the expected value of his home at the 1st of January in that year. For example, if one owns a house in

municipality A and that house has an expected value of €300.000 at the 1st of January. The property tax rate of municipality A is set to 0.2%. This means that the tax liability is €300.000 x 0.2% = €600. The property tax rate changes almost every year in all municipalities and the expected home values is an assessed value, calculated by comparing all kinds of variables such as selling prices of houses in the same street and durability. In case of a merge between municipalities in the years 2010 to 2018, there was calculated an average tax rate the same way as the average price was calculated. Table 2 clearly shows that the average property tax increased between 2010 and 2018. When keeping in mind that after the crisis, housing prices increased on average as well, one has to beware of a possible bias created by the fact that both of the variables increased over time. How to do this will be explained in the methodology section.

Table 2
Descriptive Statistics of Property tax rate (in percentages)

Year	Observations	Mean	Std. Dev.	Min.	Max.
2010	354	0,09248	0,02099	0,0328	0,1811
2011	354	0,09769	0,02193	0,0412	0,1916
2012	354	0,10402	0,02361	0,0423	0,1993
2013	354	0,11219	0,02546	0,0434	0,2108
2014	354	0,12221	0,02759	0,0451	0,23
2015	354	0,13006	0,02981	0,0457	0,2528
2016	354	0,13213	0,03104	0,0453	0,2636
2017	354	0,13166	0,03184	0,0446	0,2669
2018	353	0,12831	0,03194	0,04139	0,2612
Total	3185	0,117	0,031	0,0328	0,2669

3.3 Control variable

The last variable that is used, is the control variable. The method that will follow in the next section needs some kind of measurement of expenditures of municipalities. This control variable is very important because it helps to control for some of the endogeneity problems regarding property tax rates and the level of public service in a municipality, as will be elaborated in the methodology section.

Using the database of the *Ministry of the Interior and Kingdom Relations*, the total expenditures per capita were obtained for every municipality through the years 2010 to 2018. This is the total public spending of the local government per municipality, divided by the amount of people living in that municipality. These total expenditures consist of nine different

types of expenditures[1]. This data is already controlled for merges of municipality and therefor is not transformed.

Although the expenditures, and thus a proxy for public service level, is used as a control for almost all the research there is about property tax capitalization, it would be good to have some more data available to control. For example, data on the types of housing in a municipality, or the mobility per municipality. Unfortunately, there is not much data collected at municipality level. Hence, this thesis will estimate the capitalization effect using just these three variables. In table 3 one can see the means per year. What stands out is that the means of the expenditures do not change significantly over time, but the difference between the lowest expenditure per capita and the highest is very big. This suggests that the public service level varies between municipality (as expenditures per capita is used as a proxy of public service level), and is therefore a good control variable.

After controlling for merges, every year consists of 354 municipalities. That results in a total of 3186 observations. There are 6 missing measurements in the data, both in 2014 and 2015 there is one measurement missing of the expenditures. In 2018 there are 4 missing measurements of the expenditures, one of those is also missing for the average price and property tax rate. Excluding these 6 observations, leaves with 3180 observations to estimate the capitalization effect. Table 4 shows the descriptive statistics for all the

Table 3
Descriptive Statistics of Municipal expenditures per capita (in euros)

Year	Observations	Mean	Std. Dev.	Min.	Max.
2010	354	3080	1286	1517	15968
2011	354	3059	1502	437	21692
2012	354	2956	1210	1683	13777
2013	354	2835	1229	1423	16698
2014	353	2817	1113	1055	15207
2015	353	3152	1248	257	18426
2016	354	3140	1174	1739	17837
2017	354	3166	914	1862	9565
2018	350	2794	806	1672	7321
Total	3180	3001	1189	257	21692

[1] Administration and support; Safety; Traffic, transport and water management; Economy; Education; Sports, culture and recreation; Social Domain; Public health and environment; Public housing

4. Methodology

4.1 The capitalization estimation model

To estimate the effect of the property tax rate on housing prices, one can regress the tax rate on average housing prices. Hence, because the property tax is not only payed at the moment of buying, but every year that one owns a house, the future tax liability needs to be discounted to get a realistic estimation of the effect. This is displayed in equation 5:

$$\ln(P_{it}) = \alpha + \beta_\tau \ln\left(1 + \frac{\tau}{r}\right) + \varepsilon_{it} \quad (5)$$

Where P_{it} is the average housing price and β_τ is the coefficient of the property tax rate. Because the property tax has to be paid every year one owns a house, the property tax rate is discounted by *r.* the *r* that is used will be a fixed 3%. This follows the same fixed number earlier studies such as Yinger et al. (1988) used. To check the robustness of the discount rate, other discount rates were used as well. If full capitalization occurs, one would see a coefficient for the property tax rate of -1. Meaning that if the property tax rate would increase with one percent, the average housing price would go down by one percent. This model will be displayed as model 1 in the results. The natural logarithms are used in all the models to get an easier and more realistic interpretation of the result. One can interpreted the results as follows; If property taxes (τ) increase by 1%, the housing price (P_{it}) changes by β_τ%. Without the logarithms the interpretation of the results would be not realistic. Because one could only say something about the change in housing prices in case of a change in tax rate of 1. This is not realistic because the property tax rate varies between 0.0328% and the 0.2669%, and is therefore really unlikely to change a whole unit.

The model described in equation 5, would be a representation of the capitalization effect if there were no other variables affecting the housing prices and property tax rate. According to, among others, Oates (1969 & 1973), King (1977) and Reinhard (1981) one of the biggest bias would come from the level of public services in a municipality. This bias comes from the fact that with a higher property tax, a municipality gets a higher revenue from the property tax. This allows the high tax municipality to spend more on public services and thus increasing the quality of life in that municipality, which affects the price of a house in that

municipality. Oates (1969) already notices this by suggesting that municipalities can possibly offset the negative effect of an increase in property tax rate on the housing prices, by investing the higher revenue in public services. To control for this endogeneity issue, a proxy is used. Oates (1969) uses the spending on primary and secondary education per pupil and adds a non-school spending in his 1973 research. This thesis will also use a proxy for the level of public service, because there is no exact data on the level of public service and its quality. The proxy used is the total spending of a municipality per capita. This is not a perfect substitute for the real level of public service, but as the spending of local government is used in almost all research before, it is a good substitute. The regression model takes the following form and will be displayed as model 2 in the result section:

$$\ln(P_{it}) = \alpha + \beta_\tau \ln\left(1 + \frac{\tau}{r}\right) + \beta_1 \ln(E_{it}) + \varepsilon_{it} \quad (6)$$

In comparison to model 1 and the equation 5, the only difference is that the variable E_{it} is added. This is the spending per capita in municipality *i* at year *t*. β_1 is its coefficient and will show how big the effect of municipal spending is on the housing prices. Again β_τ is the effect of capitalization. If the property tax rate were to increase by 1%, the average housing price will change by $\beta_\tau\%$.

In the model described above there is still some room for bias. Due to great economic growth after the crisis, the housing market in the Netherlands has reached a boom. Housing prices increase by 10 percent some years and 7 out of 10 houses are sold within three months (Verhaar, 2018). Keeping in mind that the average property tax rate has increased since 2010, as can be seen in table 2, this could lead to an upward bias of the capitalization effect. This bias comes from the possibility that, due to economic growth and the average increase in property tax rate, the positive effect is higher in the estimation than the real effect. To try to control for this economic boom, year fixed effects will be added to the model. If one were to assume that the property tax rate is fixed, between every year the means of our dependent variable (Average House Price) will still vary. This variation comes from the variation in the error term, because the property tax rate is assumed to be fixed. This variation between years are the year fixed effects and will be applied by estimating the real coefficient of property tax rate by using it as a dummy. This year fixed effects will pick up any time-varying factors that

are the same for all municipalities over time. So if the economic boom on the housing market is the same for all municipalities, the year fixed effect will control for these macro-economic effects. Instinctively one might say that the housing markets are behaving differently in different parts of the country. In the cities the values of houses might increase more than the houses in the countryside, because there is more demand for houses in cities especially for starters (Kadaster, 2018). This might be a problem because it is hard to control for this, given the available data. What can be done is looking at how the housing prices change over time per province. As can be seen in figures 1 to 3 in de appendix, the similar trends per province stand out. Although it does not exist of clear evidence that the macro-economic effects are the same for every municipality. It looks like to be very helpful to use the year fixed effects, because of the similar trends the prices have in all of the twelve provinces in the Netherlands. It would be even better to have a regression equation containing some kind of control variable for economic growth per municipality, but unfortunately that kind of variable is not available for this research. Thus, the regression model with the fixed effects will take the following form:

$$\ln(P_{it}) = \alpha + \beta_\tau \ln\left(1 + \frac{\tau}{r}\right) + \beta_1 \ln(\sum E_{it}) + Z_t + X_i + \varepsilon_{it} \qquad (7)$$

With the capitalization effect is estimated by β_τ. Z_t represents the year fixed effect. One can see that also the variable X_i has been added to the regression. This is the municipality fixed effects. This variable will pick up any variation that are constant over time per municipality. These time invariant factors could be for example geographical location. Adding the municipality fixed effects will attribute to a more accurate estimation of the capitalization effect. This last model will be model 3 in the results section.

4.2 Threats to identification

There are some things about the fixed effect model that have to be pointed out regarding the identification of a causal effect. The methods might be threatened by some endogeneity issues. One of which is the possible omitted variable bias (OVB) and the other is the possible reverse causality.

An OVB occurs when there is a variable that is correlated with both the dependent and one or more of the independent variables, butnis not included into the regression. In this case that would mean that there are variables that correlate with the average housing price as well

as with the property tax rate. An example of this kind of variable would be the level of public service in a municipality. A higher property tax rate, would imply a higher property tax revenue, this revenue can be used by a municipality to upgrade their quality of public services. Hence, a positive correlation between property tax rate and level of public service. Between the level of public service and the price of a house in a municipality also exists a positive correlation. The higher the level of public service, the more people are willing to pay for their house in that municipality. If this correlation between the omitted variable and the independent and dependent variable are of the same sign (so both negative or both positive), this would lead to an overestimating of the capitalization effect. If the signs of the correlations are different (thus, between the independent and the omitted variable positive; and between the dependent and omitted variable negative, or vice versa) it would result in an underestimating of the effect. That is why the expenditures of the municipalities is included, to control for the overestimation.

The second endogeneity issue is the possible reversed causality. This reverse causality can come from the possibilities that municipalities let their property tax rate depend on the housing prices in their jurisdiction to generate the amount of tax they need to balance the budget. If this would be the case, it would mean that the tax rate depends on the housing prices and not the other way around. It is difficult to test whether the model indeed suffers from reverse causality.

Although it is not allowed for municipalities to adjust their property tax rate just to balance their budget (It would be against the principles of good governance), it is likely that it happens (Rein, 2018). Making the concern for reverse causality even bigger.

There is one more factor that might rule for the effect of the prices on the tax rate instead of the other way around, like it is tested in this thesis. As shown in the results, the average property tax paid contrasts with the total price of a house. It might be reasonable to say that one who is going to buy a house, does not keep in mind the property tax, because it is not that high. When researching this same effect in the future, it might be helpful to also look at the salience of the property tax.

There is no straight forward solution to get rid of this possible reverse causality. It might be interesting for further research to find methods that overcome this problem. For example, if one could find a good instrument to test the effect of property tax rate on housing prices. By using an instrumental variable (IV) one would regress the instrument on the

independent and the dependent variable and divide this regression estimation to get the effect of the independent variable on the dependent variable.

The use of an IV needs to fulfil three assumptions. First, the IV must have a clear and strong causal effect on the independent variable (so in this research on the property tax rate). Second, the IV has to be uncorrelated with the error term. And last, the IV does not have a direct effect on the outcome (in this case average housing price).

5. Results

The results of all the models can be found in table 5. In the three columns, the results of the modes one, two and three can be found respectively. All of the models have significant coefficients for the Tax rate with either one or five percent respectively. The first model just estimates the capitalization effect under the circumstance that a normal OLS estimation would capture all of the effect of property tax rate on average housing prices. As described before this model is unrealistic because of the possible endogeneity coming from the level of public services per municipality and the absence of fixed effects. The estimation in the first model is 0,0304, what one can interpreted as follows; If the property tax rate would increase by 1%, the average price of a house would also increase, but with only 0,0304%.

The values of R-squared are also fairly low. The table shows three types of R-squared. All of these mean something different. The within R-squared, tells how much of the variation in the housing prices within the municipalities is captured by the model. Or in other words, how well do the explanatory variables account for the change in housing prices within a municipality over time. The between R-squared tells us how much of the variation in the housing prices between municipalities is captured by the model. The overall R-squared is an weighted average of the two. It is hard to say that one of these is more important than the other, but in mind that the model that is ultimately used to estimate the effect is a fixed effect model, it can be said that the within R-squared gives some good insight for the explanatory power of the model. Since fixed effects is also known as the within-estimator.

Considering this it is reasonable that the between R-squared is a lot higher than the within R-squared in the first model, since there are no fixed effects added. The same holds for the estimation in model 2. One can see that after adding fixed effects in model 3, the within R-squared becomes 0,7501, implying that 75,01% of the variation in change in housing prices within municipalities is accounted for by the independent variables and fixed effects.

The second model is more realistic, in terms of the interpretation of the coefficient, because of the addition of the control variable. The coefficient of the tax rate in the second model is 0,0256. One can say that in the second model, if the tax rate increases by one percent, the average price of a house goes up with 0,0256 percent. The effect is statistically significant on a 5 percent level. One can see that by adding the municipal spending as a control variable, the effect of property tax rate decreases by almost 16% (0,0048 percentage point). Even

though the effect of the expenditures per municipality itself is nog statistically significant, it does influence the magnitude of the effect of the property tax rate. What stands out in both the first and the second model is the sign of the effect. While almost all literature describes a negative effect of the property tax rate on housing prices (if the tax rate increases, the average housing price should decrease), the effect in model 1 and 2 are positive. This might be the result of the absence of the time fixed effects.

Without the use of these fixed effects, the estimation can suffer from bias due to an aggregate rising trend in tax rate and housing price from the years 2010 to 2018. To control for this trend, it is necessary to add the year fixed effects.

The third model does include the year fixed effects, as well as the municipality fixed effects. This will control for the bias that is due to an aggregate trend and the time invariant factors per municipality, respectively. The third model is the most accurate estimation of the capitalization effect of property tax. In the fourth column of table 5 the results of model 3 are shown and what immediately stands out is that this result is more in line with the written literature about property tax capitalization. The coefficient of the effect of the property tax rate in the last model is -0,1395. This coefficient is statistical significant at the 1 percent level. This can be interpreted as follows: if the tax rate increases by 1 percent, the average housing price decreases with 0,1395 percent.

Table 5
Capitalization effect

Outcome: Housing prices			
Model	(1)	(2)	(3)
Tax rate	0,0304*** (0,0115)	0,0256** (0,0116)	-0,1395*** (0,0365)
Expenditures	-	0,0111 (0,0128)	-0,0066 (0,0089)
Controlled for municipal spending	No	Yes	Yes
Controlled for year and municipality fixed effects	No	No	Yes
Observations	3185	3180	3180
R^2			
- Within	0,0078	0,0101	0,7501
- Between	0,2491	0,2789	0,2575
- Overall	0,1315	0,1617	0,2001

*Note: Statistical significance is denoted by: *** p < 0,01, ** p < 0,05, * p < 0,10. Robust standard errors are reported in parentheses.*

Even though a rise of 1 percent in the property tax rate results in almost a 1/7th percent decrease in prices, in absolute numbers the amount of euros paid extra on taxes pale into insignificance compared to the actual amount the average house decreases in value. The average change of the property tax was 2,6 percent in 2016 (as can be found in table 8 in the appendix). The average property tax rate in 2015 was 0,13006%, the average house cost €232.760 in that year. Hence, the average property tax paid in 2015 was €302,73[2]. Thus, on average the property tax increased from 2015 to 2016 with just €7,87[3]. With the estimation of the model, the average housing price would drop with €844,22[4].

What stands out is not necessarily the magnitude of the effect, but the sign. The majority of the theory described in the theoretical framework suggest that the capitalization effect is negative. In other words, if individuals are perfectly mobile, an increase in the property tax rate should decrease the average housing price to compensate for the tax liabilities in the future. This model confirms this theory. Although people are not perfectly mobile in the real world, still the same effect is found. An increase in the property tax rate in Dutch municipalities, leads to a decrease in the average housing prices.

Another thing that stands out is the big difference between model two and three in terms of the sign of the coefficients. The coefficient without the fixed effect is positive, where on the other hand, with the fixed effects included the sign is negative. This difference shows that the second model suffers from severe upward bias. This bias is generated by the aggregate rising trend of the housing market between 2010 and 2018. After adding the year fixed effects, this bias is controlled for, which results in a more representative estimation of the capitalization effect. The year fixed effects are a good way to control for the aggregate rising trend, but only if this rising trend is the same for every municipality.

Then there is the question if the results would be comparable for every kind of 1% change in the tax rte. Intuitively a change from 0,1% to 0,11% and 10% to 11% do not have the same effect, because even though percentage wise the increase is the same, but in absolute euros they differ radically. Hence, in the Netherlands the difference between property tax rates are not as drastic as described above, but still the lowest property tax rate in 2018 was 0,04139% where the highest was 0,2612%.

[2] €232.760 * 0,13006% = €302,73
[3] 302,73 * 2,6% = €7,87
[4] 2,6 * -0,1395% = -0,3627% → 232,760 * - 0,3627% = -€844,22

To find out if the initial height of the property tax has an influence on the effect it has, the same model 3 is used, but now the property tax rates are classified from low to high.

Table 6
Capitalization effect, by tax rate range

Outcome: Housing prices						
Range Tax Rate (percentages)	0 - 0,05	0,05001-0,1	0,10001-0,15	0,15001 - 0,2	0,20001-0,25	0,25001-0,3
Tax rate	-1,2035*** (0,0978)	-0,1874** (0,0878)	-0,1500*** (0,0669)	-0,0728 (0,0968)	0,2921 (0,2323)	2,3939** (0,3725)
Expenditures	-0,3548*** (0,0497)	-0,0056 (0,0201)	-0,0016) (0,0101))	-0,0005 (0,0238)	-0,0364 (0,1478)	0,0594 (0,0931)
Observations	16	991	1742	369	43	11

*Note: Statistical significance is denoted by: *** p < 0,01, ** p < 0,05, * p < 0,10. Robust standard errors are reported in parentheses.*

The differences between municipalities with an initial low property tax rate and the municipalities with a high tax rate are striking. The effect for the lowest property tax rates, 0 to 0,05%, is -1,2035. Meaning that if the property tax rate were to increase by 1%, the prices of housing drop by 1,2035%. If one compares that to the highest tax rate municipalities, from 0,25001% to 0,3%, the difference is big. Not only is the sign of the effect changed, from negative to positive. The effect itself almost doubled. If the property tax rate would increase by 1%, in a municipality with an initial tax rate between 0,25001% and 0,3%, the average housing price will increase by 2,3939%.

Although the samples, for these two tax rate ranges, are not large; the coefficients are statistically significant on either the 1 or 5 percent significance level. Hence, the amount of observations is already low, but this means that there are even less different municipalities in these samples and different years. In the low-tax municipalities sample are 4 different municipalities and in the high-tax municipalities re just 3 different municipalities. This makes it hard to interpreted the effect of the initial height of the property tax rate as causal. What one can see is that the estimated capitalization effect in model 3 (0,1395) is about the effect that is found with the gross of the municipalities. The property tax rate range between 0,05001 and 0,15001 account for 86% of all observations. The effect estimated for those two ranges are comparable to the effect found for the entire sample, both in sign and in magnitude.

6. Discussion

6.1 Reliability

There are some discussion points when it comes to the reliability of this research. Especially regarding the data there are a few things that need to be pointed out.

Although the data originates from trusted sources such as the CBS and the COELO, there are a few issues regarding the used data. The first issue is with the variable of the average housing prices. These prices are measured by the total worth of houses sold in a municipality divided by the amount of houses. The problem that might occur is that if in a particular year only expensive houses were sold the estimation suffers from a selection bias, because the houses sold in one year might not be representative compared to houses sold in the next year.

A possible solution for this problem is the use of a price index, which controls for the types of houses sold. These numbers do exist for the provinces in the Netherlands (as shown in figure 1 of the appendix) and for the four largest cities in the Netherlands[5]. Unfortunately, these numbers are not available on the municipality level, which makes the average housing prices the second best data there is to use. When comparing the trends of the price index and the average housing prices (which can be found in the figures 1 and 2 of the appendix), one can see that the trends look similar to each other. Although it cannot be said that it can be considered clear evidence that the average prices are a perfect substitute for a price index, it does relax the concerns for this issue, because it is likely that both the price index and the average housing prices change relatively the same overtime, making the estimation with the average prices comparable to what it would be with the use of the price index.

The second issue with the data is regarding the measure of spending on public services per municipality. The theory describes that the model need a control for this endogeneity issue, because greater public services affect the housing prices positively and greater taxes buys greater public services. The problem that occurs is from the same sort as the problem with the price index, the data is not there. To solve this problem, the overall spending per capita per municipality was brought in as a substitution. This data is still useful to control for municipal spending but does not make the estimation as accurate as data on public service expenditures only would have. Or even better, the quality level of public services.

[5] Amsterdam, The Hague, Rotterdam and Utrecht

These two issues are with the data that are integrated into the estimation model, but there is also something to say about other data that might be useful. Mobility is a factor that seems to influence the prices as well. If people can move easily than it is possible that the capitalization effect is larger, if compared to the situation where people cannot move to another jurisdiction because of the lack of mobility.

Therefor it might be insightful for future research to test whether the mobility affects the impact of the property tax rate on housing prices. One might use the amount of moves into and out of the municipality as a proxy of mobility, or compare for example small and large municipality with respect to mobility. What also needs to be considered regarding the effect of mobility, is the composition and size of the population in a municipality. If a large portion of the population is e.g. a student, it is likely that there are extra of moves out of the municipality (because students graduate and search for jobs elsewhere) and into to municipality (new students coming to study).

There is also the salience of the tax that might influence the effect of it on the housing prices. Are individuals aware of the amount of property tax they pay and about the change of it. If individuals know not really much about the property tax and its change, it is likely that it will not have a causal effect on the housing prices. But if individuals are, on the other hand, very salient about property tax, it is more likely that the effect of it of the housing price is causal. That is why it might be useful to include the salience of property tax in any future research.

6.2 Robustness checks

To find out if the model that we estimated in model 3 is a robust result, some small changes were made to compare. The outcomes of these small changed models can be found in table 7. The first model shown in table 7 is model 3b, this model does not have the municipal fixed effects included in the model. The coefficient for the property tax rate decreases by 31% (0,04787 percentage point). This means that the estimated capitalization effect without the municipal fixed effects is larger than with the municipal fixed effects. It therefore seems that some of the capitalization effect can be awarded to the municipal individual effects.

Model 3c has as difference to model 3, that the expenditures are left out. The expenditures of the municipalities were added to the model, to decrease the bias that occurs due to the spending on public services of municipalities. The mechanism behind this is that

the housing prices are affected positively by the public services a municipality offers. If there is more spending on public services, it might be more attractive for individuals to live in that particular municipality, making the prices of the houses go up. Theoretically it is likely that this kind of bias exists, but if the control variable is left out of the model the estimation does not change relatively. In table 7, in model 3c, the coefficient of the model without the control for municipal spending can be found. If compared to the estimation of model 3, one can see that there is almost no difference in outcomes. Suggesting that the expenditures do not cause some kind of bias. It can also mean that the expenditures per capita of a municipality is not a good proxy for a level of public service in that municipality, because almost all written literature emphasize that the level of public service affect the amount of tax people are willing to pay and the other way around and therefor the capitalization of those taxes into the housing prices.

The models 3d and 3e are different in the discount rate r. Where model 3 uses the 3%, following the fixed number Yinger et all. (1988) and Palmon & Smith (1998) use, the models 3d and 3e use a smaller discount rate, 2 and 1 percent respectively. One can see that the models with the lower discount rate also result in a smaller effect of property tax rate, although the change is not that big. A decrease of 33% of the discount rate (from 3% to 2%), results in about only a 6% smaller effect of property tax rate. A decrease of 66% in the discount rate (from 3% to 1%) only gives a 12% smaller effect.

What stands out though is that the R-squared of all of the models 3 (3 to 3e) are almost identical, implying that they all have the same explanatory power.

Table 7
Robustness checks for model 3

Outcome: Housing prices				
Model	(3b)	(3c)	(3d)	(3e)
Tax rate	-0,1837***	-0,1399***	-0,1314***	-0,1228***
	(0,0352)	(0,0363)	(0,0342)	(0,0318)
Expenditures	-0,01314	-	-0,0066	-0,0066
	(0,0085)		(0,0088)	(0,0089)
Controlled for municipal spending	Yes	**No**	Yes	Yes
Controlled for municipality fixed effects	**No**	Yes	Yes	Yes
Discount rate r	0,03	0,03	**0,02**	**0,01**

Observations	3180	3185	3180	3180
R^2				
- Within	0,7495	0,7505	0,7502	0,7503
- Between	0,2626	0,2419	0,2559	0,2539
- Overall	0,2288	0,1950	0,2008	0,2013

*Note: Statistical significance is denoted by: *** p < 0,01, ** p < 0,05, * p < 0,10. Robust standard errors are reported in parentheses. The bold cells are the difference the original model 3.*

6.3 Implications

The results clearly imply a negative effect of property tax rate on housing prices, this can lead to some policy implications as well. Although it is hard to make any comments on policy implications. The easy way to suggest some policy implication is to say that if a municipality wants to decrease their average housing prices, for example to give more chances for starters on the housing market, they increase the property tax rate. Although this sounds like a legitimate statement, it might be much more difficult than that. There are off course other factors that influence housing prices which cannot be influenced by a municipality, such as the desire people have to move and the difficulty it is to get a loan for a house.

It is therefore fair to say that a municipality might be able to influence the average housing price by changing the property tax rate, but it needs to stay in contrast to other factors that affect housing prices. With addition to this, it is not always easy for a municipality to change their property tax rate due to other political factors. There is the theory of the Laffer curve, which states that it is possible that by increasing a tax rate at some point, this will not generate more tax revenue but less instead. This comes from the theory that a higher tax rate demotivates people to generate income. With the property tax rate this might be a little different than for example income tax rate, because individuals cannot just decide to take a lower market prices for their home. Where they could decide to work less because of a higher tax on income. On the other hand, is it a tool that is easy to use, because of the broad jurisdiction a municipality has over the property taxes, when compared to other taxes on the municipal level.

7. Conclusion

This thesis tries to estimate the capitalization effect in the Netherlands by using cross-municipality data. Not only the capitalization effect itself is interesting, but also the implementation of this outcome with the different theories of the property tax incidence. This section will cover both the conclusions on the capitalization effect and the conclusions when implementing this result into the tax incidence theories.

7.1 Capitalization effect

By estimating the capitalization effect, the main question is answered. In the model that was used to estimate the capitalization effect, the property tax rate and the municipal spending were used as the dependent variables. Next the year and municipal fixed effects were added to the model. By using data of all municipalities over the years 2010 to 2018 the following result was estimated. When the property tax rate increases by 1 percent, the average housing price will drop by 0.1395 Percent. This result is in line with previous literature, which was first addressed by Tiebout (1956). Although the decrease in average housing prices is $1/7^{th}$ percent of the increase in property tax rate, in absolute numbers the decrease in housing prices exceeds the increase in property tax by a lot. This thesis finds a capitalization effect across Dutch municipalities, which is in line with the existing literature, but the magnitude of the effect is different. The Tiebout hypothesis states that there will be full capitalization in case of perfect mobility. This assumption of perfect mobility is not likely to be true in the real world, because it is not costless to move. Where Tiebout (1956) states that there is only full capitalization with perfect mobility, this thesis shows that in the Netherlands the capitalization exceeds full capitalization, without perfect mobility. This overcapitalization might be the result of overvaluation of future tax liabilities by individuals. Bradley (2015) found the same overvaluation, but then the other way around. He found that individuals tend to overvalue a tax rebate. Given this, it is possible that individuals also overvalue extra tax liabilities, making the prices decrease more than the property tax increases.

7.2 Tax incidence

The estimated capitalization effect can be implemented in the different views of the tax incidence if property tax. These different views being the old view, the benefit view and the new view. The benefit view argued that the property tax is not a tax at all, because in case of perfect mobility, individuals would move to a place with property tax rates that match their preference. The benefit view implies that the property tax is a voluntarily payment for a certain level of public services. This would violate the main characteristic of a tax, which is that it is involuntarily. If the benefit view is correct, one would see full capitalization. The estimation shows that the capitalization effect in the Netherlands exceeds full capitalization, which makes it possible that the benefit view holds, but it is highly likely that there are other factors in play.

The old view suggests that the consumers of housing bear the property tax rate. With this old view in mind one would expect to see a negative effect of property tax rate on housing prices. Because home owners bear the extra tax liabilities, it is likely that this will be compensated in the prices. This is indeed the result of this thesis, the home owners who see their property tax rate increase, will also see their property value decrease. And off course the other way around as well, people who live in a municipality where the property tax rate decreases, will probably see their property values increase.

Lastly, the new view, which not only suggest that the property tax has the same distribution effects as a profit tax, but also predicts the same capitalization effect as the estimation of this thesis did. The new view, developed by Mieszkowski (1972) states that in case of a higher property tax in a city, there will be a lower intensity of use of land in that city. Resulting in a lower property value. The estimation of the capitalization effect is conforming this theory, showing that a higher property tax lowers the average price of housing.

Thus, although it is hard to say whether which view regarding property tax incidence has been confirmed or denied by this thesis, one can say all three of them have some things in common with the results of this thesis. The benefit view expects full capitalization. The results of the capitalization show that in Dutch municipalities the property tax exceeds full capitalization. The new view predicts the same effect of property tax rate on housing prices as the results of this thesis does, but also suggest that it has the same distribution effects as a profit tax has. This is not researched in this thesis, but might be an interesting follow up. To

include the distributive effects of the property tax in the Netherlands. The old view suggested that the consumers of housing bear the property tax, this would lead to capitalization of the property tax rate into the price negatively. This effect is indeed found by the estimation.

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Appendix

Table 8
Average change in tax rates (in percentages)

Year	Average change	min.	Max.
2018	1,7	-18,8	26,9
2017	2,0	-8,4	20,8
2016	2,6	-12,7	37,1
2015	3,6	-11,1	44,0
2014	3,1	-12,1	32,8

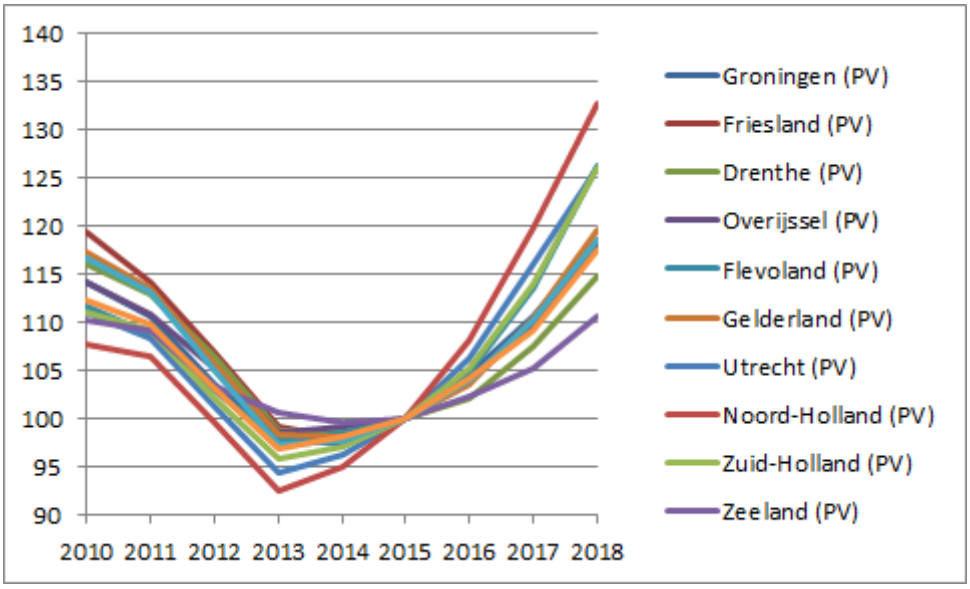

Figure 1
Development housing price index per province 2010-2018 (2015 = 100)
(Source: CBS, Kadaster)

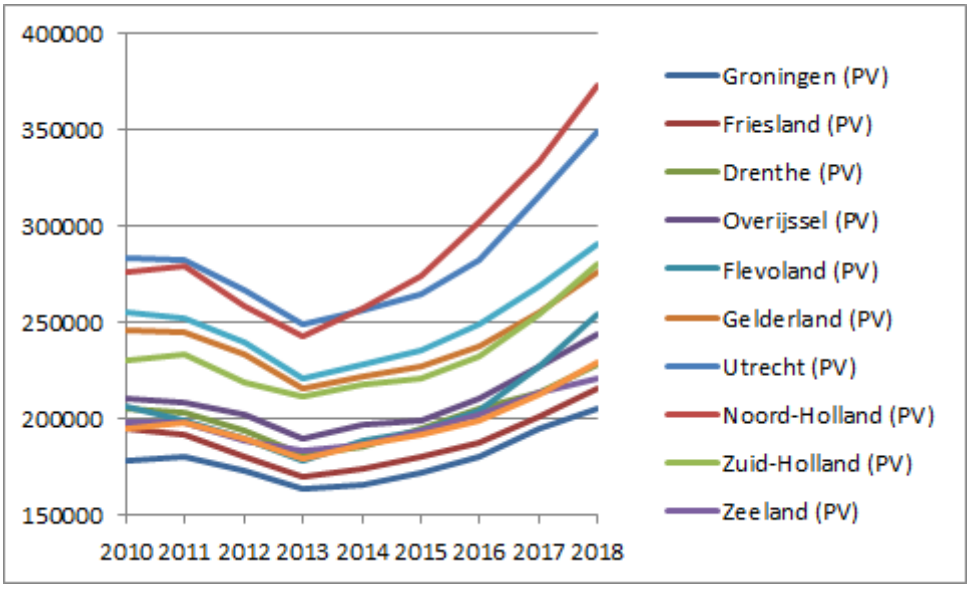

Figure 2
Development average housing prices per province 2010-2018
(Source: CBS, Kadaster)

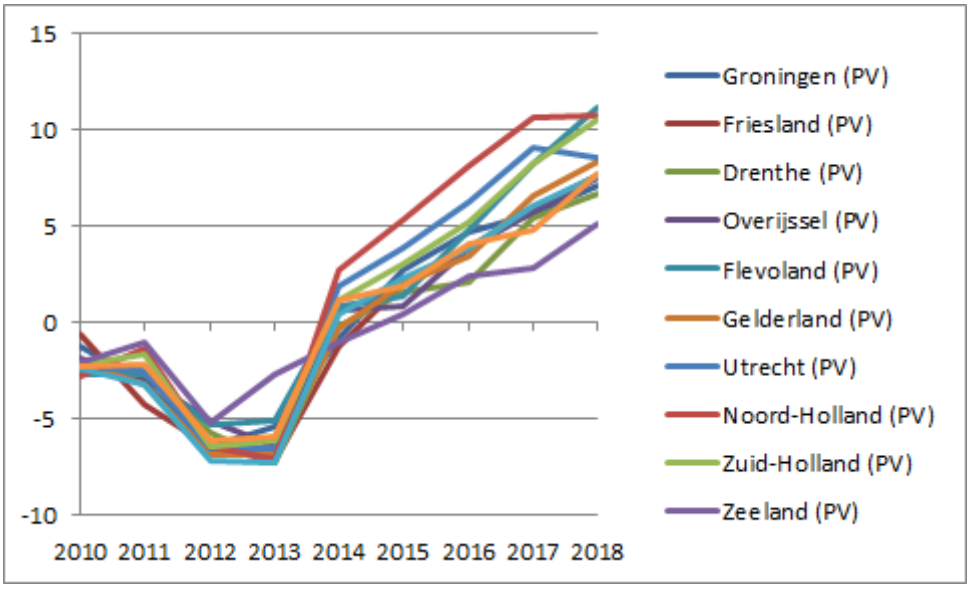

Figure 3
Development price index per province compared to year before 2010-2018
(Source: CBS, Kadaster)