
# *Capitalization of intergovernmental transfers and the income effects of the abolishment of the Dutch property tax*

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*Abstract*

This paper studies the effects of the abolishment of the user part of the property tax in the Netherlands in 2006. This major tax reform meant that municipalities lost a substantial part of their income, but they were compensated for this via an additional grant from the central government. The first part of this study discusses the income effects of the tax reform and finds that low incomes gained the most from this tax reform relatively, although in absolute terms the high incomes profited more. The second part estimates the capitalization of the compensating additional transfers from the central government to the municipalities into the house prices. Using fixed effects specifications and an instrumental variable approach, this study evidence for capitalization of over 100 percent.

## 1. Introduction

In 2006, a substantial reform in local government taxes in the Netherlands took place. A large part of the property tax for houses was abolished in that year. Before 2006, the property tax consisted of 2 parts: (i) a part payed by the *owner* of the house and (ii) a part payed by the *user* of the house. This meant that in the case of a rental house, the *owner* payed the *owner part* while the tenant payed the *user part*. An individual who is the owner and the user of a house, thus pays the user part as well as the owner part. In 2006, the user part of this tax for houses was abolished, benefiting both owners and tenants. The municipalities were compensated by the State, since they collect property taxes and in that way faced an income loss because of this policy. In total, this tax reform[1] was about almost one billion euros per year.

Already in 2002, the governing parties CDA, VVD and LPF proposed to change the property tax. They not only proposed to abolish the user part of the property tax for houses, but they proposed to abolish the owner part too (CDA, VVD & LPF, 2002). This short-lived coalition did not implement this proposal, but the next coalition again proposed to change the system of the property tax. In 2003, CDA and VVD, now together with D'66 proposed to abolish the user part of the property taxes for houses (CDA, VVD & D66, 2003) and in 2006 this policy was implemented. The main reason for this tax reform was to make an end to a tax which evoked irritation among citizens due to its large *visibility* (Tweede Kamer, 2005).

Currently, there is a debate about the re-introduction of the user part of the property tax. The Dutch State Secretary for Finance has suggested that re-introducing the user part of the property tax is an option in order to give municipalities more responsibilities in collecting taxes and to be able to lower taxes on labor (Plasterk & Wiebes, 2016) (Wiebes, 2015). And for example, the political parties D'66, CU and SGP are in favor of this re-introduction too (CPB Bureau for Economic Policy Analysis, 2017).

The purpose of this study is twofold. In the *explanatory memorandum* of this law the legislator describes the expected income effects of this tax reform (Tweede Kamer, 2005). The legislator expects that the lower income groups will profit the most from this policy. Therefore I firstly assess whether it were indeed the low income groups which gained the most from this tax reform. I compare the *ex-ante* income effects with the *ex-post* income effects. Estimating the ex-ante income effects will be done by estimating the average percentage of income spent on the user part of the property tax for different income groups. I estimate the ex-post income effects by comparing the actual change in municipal taxes among different income groups. Next to that, I study the distributional effect among municipalities since municipalities faced different income effects due to this tax reform.

I find that the ex-ante income effects predict that households with higher incomes profit in *absolute* terms more as households with lower incomes. *Relatively*, in share of income, households with lower incomes profit more from the tax reform as households with high incomes. The reason is that the share of income spent on the user part of the property tax

[1] In the remainder of this study I will often refer to the abolishment of the user part of the property tax for houses in 2006 as the *tax reform*.

decreases with income, represented by a negative Suits index. The ex-post income effects show that the drop in municipal taxes due to the tax reform is substantial. Indeed, the households with high incomes profit the most from the tax reform in absolute terms, but *relatively* in shares of income the lower income households profit the most. On average, total municipal taxes declined with 70 euros per household. When we compare municipalities within the Randstad with municipalities from outside this part of the Netherlands, we see that the average property tax paid is comparable but that total municipal taxes decreased less in the Randstad as in other parts of the Netherlands.

The second main topic of this paper is the *capitalization* of the tax reform into house prices. Put differently, this capitalization means that house prices increased due the tax reform, specifically the additional intergovernmental grant should capitalize in the house price. Other studies have examined capitalization of intergovernmental grants in house prices before. For example, Allers and Vermeulen (2016) find full capitalization of equalizing grants of a major reform in the fiscal equalization system in the Netherlands. Barrow and Rouse (Barrow & Rouse, 2004) study the effectiveness of additional school spending in the US. School districts in the US have different school spending levels. They find that additional school spending leads to increased property values. In other words, additional school spending is valued by residents and capitalizes into house prices. In this study, I assess whether there was capitalization of the intergovernmental grant into house prices too.

In order to estimate this effect, this study uses a fixed effects specification which allows controlling for time trends, time-invariant differences between municipalities and municipal-specific time trends. Also an instrumental variable approach is used which instruments either (i) the change in the general grant due to this tax reform or (ii) the change in the general grant added with the supplementary grant on the total general grant per municipality. I find positive and strongly significant effects of the tax reform on house prices using the fixed effects specifications. The results are robust for different time periods. The IV-estimate results in a positive and strongly significant effect which is comparable to the fixed effects estimates. The comparison between the capitalization effects for municipalities within the Randstad and municipalities outside the Randstad separately shows that the capitalization rate for municipalities outside the Randstad is higher as for municipalities within the Randstad. For the preferred instrumental variable estimate, full capitalization cannot be rejected.

The next section describes the institutional setting in the Netherlands and the reform in more detail. Section 3 discusses the distributional effects of the tax reform. After section 4 discusses the related literature, section 5 is devoted to the capitalization of the tax reform into house prices. Section 6 discusses the results from the capitalization estimates and section 7 concludes.

## 2. Institutional setting and description of the reform

### *2.1 Institutional setting*

The Netherlands consist of 393 municipalities with on average 40.000 inhabitants per municipality (Statistics Netherlands, 2015).[2] These municipalities are responsible for a whole set of governmental services. These tasks range from granting welfare benefits to the construction and maintenance of roads. Although the municipalities in the Netherlands have a rather extensive set of tasks, they do not collect a lot of taxes themselves. Of all the revenues from taxes of the government, in 2017 only 3,4 percent is collected by municipalities (Hoeben, Kwakkel, Veenstra, & Allers, 2017). In total, local authorities are responsible for only 7,5 percent of the tax collection; the lowest percentage of all OECD-countries (OECD, 2012).

Municipalities in the Netherlands are mainly financed through transfers from the State; about 75 percent of its revenues consist of such transfers. There are different kinds of transfers from the central government to the municipalities. 12 percent of municipal revenues consist of specific grants (Kattenberg, Martens, & Vermeulen, 2017). This type of grants is specifically meant for one task. However, the majority of transfers from the central government to the municipalities flow via the *Municipality Fund* (Gemeentefonds)[3]. Of these transfers 44 percent consists of the *general grant* (Algemene Uitkering). In contrast to specific grants, municipalities may spend the money they receive from the general grant of the Municipality Fund in the way they like. The amount each municipality receives from this general grant is determined by different standards divided into 11 clusters. Examples of these clusters are *work and income* and *infrastructure and area development*. In total, there are 66 standards of which some are in multiple clusters. Examples of these standards are the *number of elderly people* and *the number of houses in a municipality*. The reason this general grant is distributed using this system is that the State wants to compensate for differences between municipalities. Municipalities namely differ in, for example, the composition of the population and the quality of the soil. The principle is that municipalities should be able to deliver the same local public service provision at the same property tax rate. Using this system, municipalities with, for example, relatively many pupils will have relatively high costs for school buildings. Therefore, they are compensated for this through the general grant of the Municipality Fund so they can still deliver the same local public service provision with the same property tax rate as other municipalities with fewer pupils.

Taxes and fees are only responsible for 17 percent of municipalities' total revenues (Allers, de Kam, Sterks, van Leeuwen, & Monsma, 2002). Of these taxes collected by the municipalities the property tax is the most important one. Table1 shows the realized municipal taxes and fees for the years 2005 and 2006. In 2005, municipalities collected on average 465 euros of taxes and fees per resident. The property tax was the most important municipal tax;

[2] The number of municipalities in the Netherlands has further decreased to 388 in 2017 (Statistics Netherlands, 2017). Since most data is only available up to 2015 I will use the municipalities of that year. So, results are always depicted into municipalities of the year 2015 unless indicated otherwise.

[3] Specific grants do not flow from the Municipal Fund, but are distributed directly from the central government to the municipalities.

the user and owner part together were responsible for 48 percent of total municipal tax revenue. The abolishment of the user part of the property tax for houses had a large impact on this number. The user part property tax dropped absolutely from 97 to 31 euros per resident and in relative importance it dropped from 21 percent of the total municipal taxes to 8 percent.[4] Some other fees and taxes increased a little (specifically, parking taxes, sewage charges and building permits) but in total the realized revenues from municipal taxes and fees decreased with 53 euros per resident between 2005 and 2006.

Another issue here is that the revenues from several of these municipal taxes may only be spent on one specific task. These taxes include the sewerage charges, the cleaning and waste taxes and the fees civil affairs secretariat. The property tax is one of the few taxes municipalities may spent the way they like. Next to that, there are no restrictions regarding the amount of the tax. This makes the property tax an important instrument for municipalities to collect taxes at their preferred rate and to spend it on subjects they prefer. Although the property tax is only a small tax in terms of total State revenues, it is of great importance for municipalities.

| | 2005 | | 2006 | |
|---|---|---|---|---|
| **Total municipal taxes and fees** | € 465 | | € 412 | |
| **Total municipal taxes** | € 266 | 57% | € 202 | 49% |
| **- User part property tax** | € 98 | 21% | € 31 | 8% |
| **- Owner part property tax** | € 125 | 27% | € 126 | 31% |
| **- Parking tax** | € 24 | 5% | € 27 | 7% |
| **- Other taxes** | € 17 | 4% | € 17 | 4% |
| **Total municipal fees** | € 199 | 43% | € 210 | 51% |
| **- Sewerage charges (combined** | € 57 | 12% | € 62 | 15% |
| **- Cleaning and waste taxes** | € 100 | 22% | € 101 | 25% |
| **- Building permits** | € 28 | 6% | € 33 | 8% |
| **- Fees civil affairs secretariat** | € 13 | 3% | € 15 | 4% |

*Table 1: Realized municipal taxes and fees (2005-2006). Numbers are in euros/resident. Source: Statistics Netherlands* (2016). **Other municipal taxes consist of the dog tax, tourist tax, advertising tax, commuter tax and precision tax. None of these taxes has changed in absolute or relative size.*

Next to that, the sewerage charges and cleaning and waste taxes deserve special attention. Municipalities in the Netherlands are responsible for providing these services and have to collect taxes in order to finance these services. Municipalities may use the revenues of these taxes only for the purpose of these services. So, sewerage taxes may only be used for sewerage. Most of the municipalities arrange this in such a way, that they exactly cover the costs of these sewerage and waste services by these taxes. But some municipalities choose to have lower sewerage and waste taxes and finance these services (partly) through, for example, higher property taxes. Due to the tax reform, some of these municipalities chose to increase

[4] Note that the user part of the property tax for commercial property was not abolished. The remaining revenues from the user part property tax in 2006 is thus only this part for commercial property, while the numbers in 2005 included both the tax for commercial property as well as for houses.

their sewerage and waste taxes in 2006 in order to finance these services completely by them. They did so, because due to the tax reform they have fewer possibilities to finance these services through the property tax.

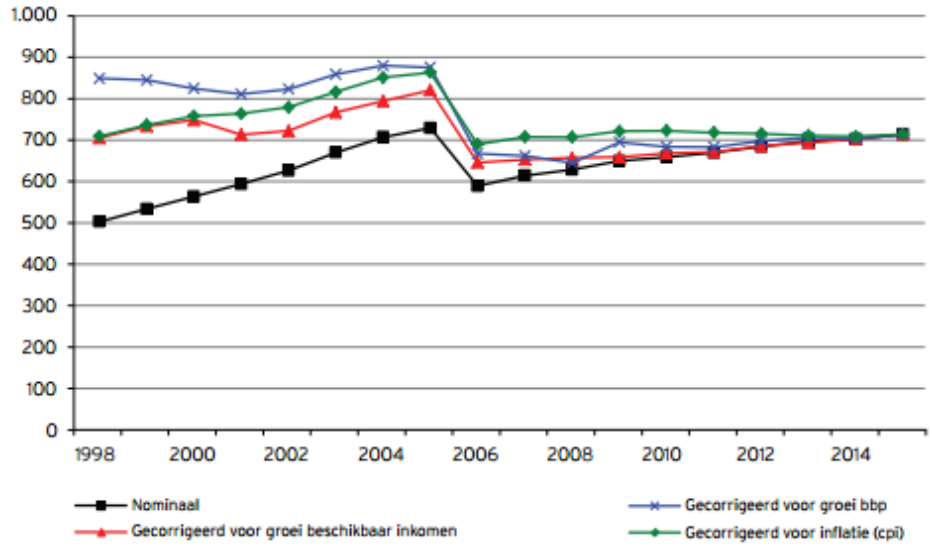


*Figure 1: Trend in total municipal taxes for multi-person households, 1998-2015. Source: Atlas van de lokale lasten* (2015).*The black, square-dotted line represents the nominal value. The three other lines are corrected for change in available income (red, triangular-dotted line), change in GDP (blue, star-dotted line) and inflation (green, diamond-dotted line).*

As figure 1 shows, the tax reform caused a substantial decrease in total municipal taxes. The figure shows a clear upward trend in nominal municipal taxes. The tax reform caused a sharp drop of about 100 euros for multi-person households, after which it increased again at approximately the same pace. As the figure shows, the nominal level of municipal taxes is almost back at its pre-tax reform level in 2015.

*2.2 Description of the reform*

As explained in the introduction, before 2006 the property tax consisted of an owner part and a user part for both *houses* and *commercial property*. At the time of the reform, a household spent on average 125 euros of the user part of the property tax (Tweede Kamer, 2005). From the first of January 2006 onwards, the user part of the property tax for houses was abolished. So, for houses only the owner part remained while for commercial property both the owner- and the user part remained. Together with this abolishment of the user part of the property tax for houses, the remaining parts were both being maximized and minimized: which means that municipalities could choose the tariff of the property taxes within a certain *bandwidth*. But from 2010 onwards, this bandwidth was abolished again and municipalities were completely free to choose their tariffs (Allers, Hoeben, & Zeilstra, 2009).

Because of the abolishment of the user part of the property tax for houses, municipalities lost a substantial part of their incomes[5]. However, municipalities were compensated for this

[5] See Table 1

income loss by the central government. This compensation was done via a higher *general grant* from the *Municipality Fund*. This compensation was done in such a way that the municipalities *on average* did not loss any income.

Nonetheless, since municipalities set different property tax rates before the tax reform not every municipality was compensated fully for the income loss by this adjustment of the general grant. Municipalities which had a relative high property tax rate faced a net loss because the compensation is not high enough to offset the income loss. On the other hand, municipalities with a low tax rate have a net gain since the compensation is higher than their income loss. The legislator considered these differences undesirable and had the opinion that no municipality should face a real loss of income due to this policy. Therefore, a temporary *supplementary grant* was introduced. This supplementary grant means that in the first year after the reform (i.e. 2006), all the municipalities which had a net gain because of the policy, payed this gain to the supplementary scheme and all the municipalities which faced net loss, received money from this scheme equal to this net loss. In other words, in 2006 ultimately no municipality faced a net loss or a net gain because of this tax reform.

But this supplementary grant was gradually phased out. Every year, the Municipality Fund grows at the same pace as the expenditures of the central government. This additional money is called the *accres* (i.e. an additional gain). So, when this accres is 3 percent this means that the general grant from the Municipality Fund increases with 3 percent. The extra money municipalities receive from this general grant is subtracted from the supplementary grant a municipality with a net loss receives. In this way, the supplementary scheme is gradually phased out. At the beginning of this scheme, the legislator predicted it would take 25 years before the supplementary scheme has finished (Ministry of Internal Affairs, 2005). However, because the government expenditures did not increase for a couple of years[6], the Municipality Fund did not increase too. So, it might take even longer before this supplementary scheme is finished.

The final issue here is the previously discussed sewerage and waste taxes. When a municipality in 2005 had not fully covered its' cost of the sewerage and waste services with the corresponding taxes *and* it faced a net loss because of the tax reform it receives a lower supplementary grant. The amount of money the municipality can gain by covering all the costs of sewage and waste services by setting higher sewage and waste taxes is withheld from the supplementary grant.

[6] Government expenditures did not increase from 2010 until 2013. So, for 4 consecutive years the supplementary scheme did not become smaller.

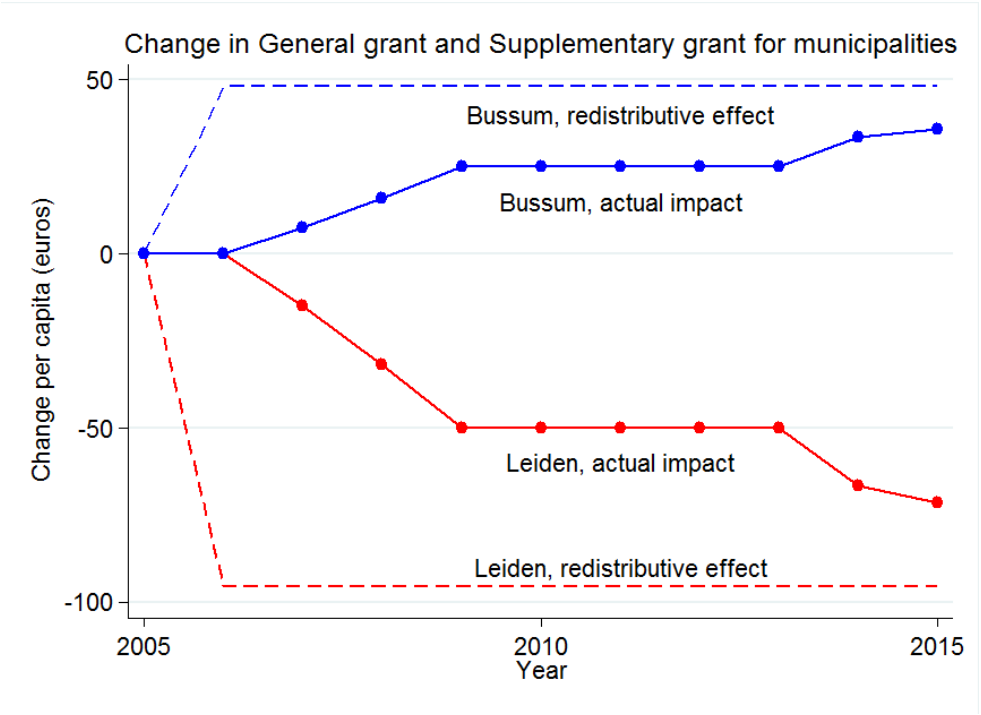


*Figure 2: Redistributive effect and actual impact of tax reform on municipal budgets of Bussum and Leiden.*

Figure 2 illustrates the effect of the supplementary grant on the budget of municipalities. It depicts two Dutch municipalities: Bussum and Leiden. Bussum is the municipality which gained the most from the tax reform. It gained almost 50 euros per capita. Leiden faced the largest decrease in net income: per capita, it lost 100 euros because of the tax reform. These numbers are represented by the dashed lines. This effect is simply the lost income because of the abolishment of the user part of the property tax added with the compensating change in the general grant from the municipal fund.[7] So, this is without the supplementary grant. The solid lines represent the effect of the tax reform on the municipal budget *including* the supplementary grant[8]. As the figure shows, in 2006 the effect on the municipal budget is zero. Remind that this is because in 2006 the redistributional effects of the tax reform were equalized completely. After 2006, the supplementary scheme was gradually phased out until 2009. From 2009 until 2013, the general grant (which is linked to the total expenditures of the State) did not increase and therefore the supplementary grant did not change. From 2013 onwards, the supplementary grant restarted its phasing out.

[7] In this study I will refer to this effect as the 'Redistributive effect'.
[8] In this study I will refer to this as the 'Actual impact' of the tax reform.

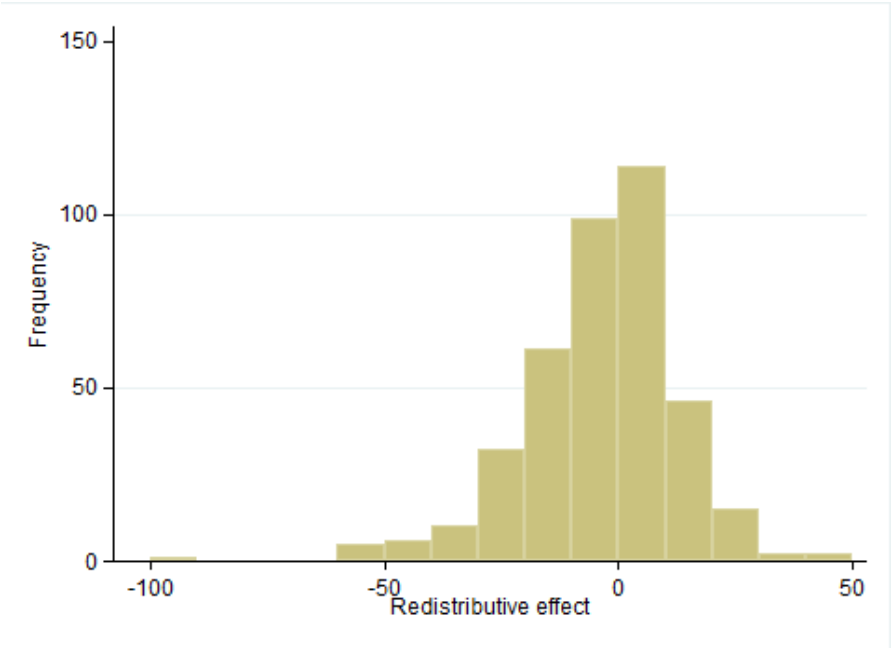


*Figure 3: Histogram of redistributive effect of tax reform*

Bussum with a net gain of almost 50 euros per capita and Leiden with a net loss of almost 100 euros per capita are exceptions in terms of magnitude of the redistributive effect. Figure 3 shows the histogram of the redistributive effect (thus, without the supplementary grant). Most municipalities faced a rather limited redistributive effect due to this policy. Specifically, 320 out of the 393 municipalities have a redistributive effect between -20 and 20 euros per capita. Next to that, figure 4 shows the correlation between (i) the income effects for municipalities purely due to the abolishment of the user part of the property tax and (ii) the change in the general grants. We see that there is a negative correlation between these two. Municipalities with a large negative income effect face a high change in their general grant. The light red solid line represents the situation where the change in the general grant is exactly equal to the income effect. So, in that case the redistributional effect is equal to zero. The darker red lines are 20 above or below the "zero"-line respectively. We see that most of the municipalities fall between these lines which means that they faced a redistributive effect of between -20 euros and + 20 euros per capita.

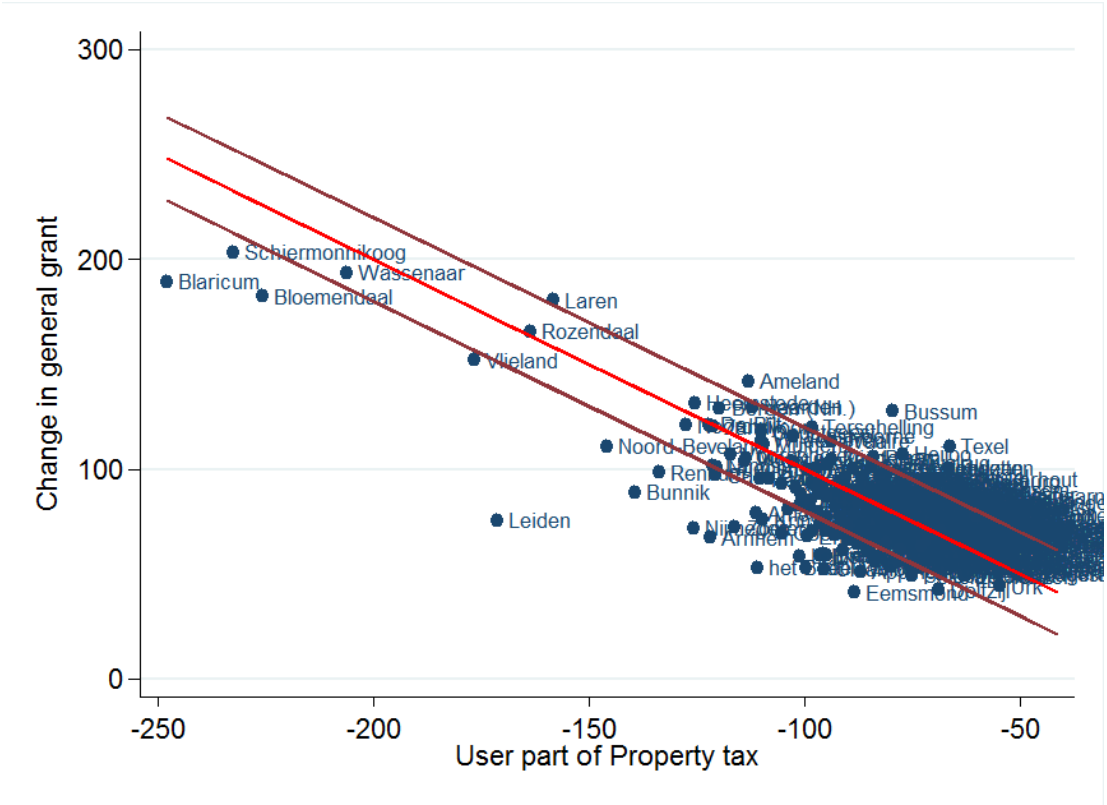


*Figure 4: Scatter of change in general grant between 2002 and 2006 and the income effect of the abolishment of the property tax. Sources data: Wbo 2002 and WoON 2006.*

## 3. Distributional effects

As discussed in section 2, the tax reform did hit municipalities in different ways. Some municipalities gained from the reform, while other municipalities lost. Next to that, the reform also had different implications for different groups of households. In this section I will elaborate on the distributional effects of this policy. Firstly, I will discuss the distributional effects for households and secondly I will discuss the distributional effects among municipalities.

### *3.1 Income effects among households*

#### *3.1.1 Ex-ante income effects among households*

Different types of households pay different amounts of property tax. Table 2 shows the predicted income effect based on the average amount of property tax each group pays per year and on their average income.

The households are divided based on their income, age, size and whether they own or rent a house. This table is based on table 2 of the explanatory memorandum of this law (Tweede

Kamer, 2005). First I divided the households into four income groups[9]. Next to that, I distinguish between individuals who are older than 65 and those who are younger. The former group consists thus approximately of pensioners while in the latter there are only few pensioners. I also distinguish between single households and households with more than one person. Finally, I distinguish between households who rent a house and households who own a house. Although I used the same data and the same groups the outcomes are rather different as those from the explanatory memorandum. A reason for this was not found.

In the table I divide between imposed property tax and property tax paid. The difference between these two definitions is the so-called *remittances*. 98 percent of the municipalities remit all the municipal taxes for households with income below the social minimum (Tweede Kamer, 2005). These households thus do not have to pay any property tax in these municipalities. The *imposed property tax* for these households is then the property tax they must have paid if it was not remitted. The *property tax paid* is, in contrast, the amount of property tax they have actually paid. For these households whose municipal taxes are remitted, this by definition equals zero. Therefore, the average property tax paid is always lower as the imposed property tax. These remittances play an important role. In the Netherlands, almost 500.000 out of 6.6 million households receive remittances.

[9] The income groups are respectively: (i) households with earnings lower than the social minimum, (ii) income between social minimum and modal income, (iii) income between modal income and 2 times modal income and (iv) households with income more than 2 times modal income.

| | *TENANTS* | | | |
|---|---|---|---|---|
| **Household type** | **Households** | **Imposed property tax** | **Property tax paid** | **Property tax paid / income** |
| 1 pers 65- [<=min] | 222.300 | € 95 | € 65 | 0,5% |
| 1 pers 65- [min-mod] | 669.900 | € 90 | € 70 | 0,4% |
| 1 pers 65- [1 - 2x mod] | 242.800 | € 100 | € 95 | 0,3% |
| 1 pers 65- [>2x mod] | 28.600 | € 120 | € 115 | 0,3% |
| | | | | |
| 2+ pers 65- [<=min] | 117.400 | € 105 | € 80 | 0,4% |
| 2+ pers 65- [min-mod] | 514.600 | € 105 | € 80 | 0,3% |
| 2+ pers 65- [1 - 2xmod] | 499.000 | € 110 | € 105 | 0,3% |
| 2+ pers 65- [>2x mod] | 141.400 | € 125 | € 125 | 0,2% |
| | | | | |
| 65+ [<=min] | 100.500 | € 100 | € 90 | 0,5% |
| 65+ [min-mod] | 629.500 | € 100 | € 85 | 0,5% |
| 65+ [1 - 2x mod] | 125.400 | € 115 | € 115 | 0,4% |
| 65+ [>2x mod] | 19.000 | € 130 | € 130 | 0,3% |
| TOTAL | 2.864.700 | € 105 | € 90 | 0,3% |

*Table 2: Income effect based on property tax. Property tax here means 'the user part of the property tax for houses'. Source data: Wbo 2002*

| | *OWNERS* | | | | *TOTAL* | | | |
|---|---|---|---|---|---|---|---|---|
| **Household type** | **Households** | **Imposed property tax** | **Property tax paid** | **Property tax paid / income** | **Households** | **Imposed property tax** | **Property tax paid** | **Property tax paid / income** |
| 1 pers 65- [<=min] | 25.200 | € 135 | € 135 | 0,8% | 247.500 | € 100 | € 75 | 0,5% |
| 1 pers 65- [min-mod] | 149.000 | € 130 | € 125 | 0,6% | 818.900 | € 100 | € 80 | 0,4% |
| 1 pers 65- [1 - 2x mod] | 218.700 | € 130 | € 130 | 0,4% | 461.500 | € 115 | € 110 | 0,4% |
| 1 pers 65- [>2x mod] | 54.500 | € 170 | € 160 | 0,3% | 83.100 | € 150 | € 145 | 0,3% |
| | | | | | | | | |
| 2+ pers 65- [<=min] | 100.500 | € 180 | € 175 | 0,5% | 219.900 | € 140 | € 125 | 0,4% |
| 2+ pers 65- [min-mod] | 268.400 | € 150 | € 145 | 0,5% | 783.000 | € 120 | € 100 | 0,4% |
| 2+ pers 65- [1 - 2xmod] | 1.194.500 | € 150 | € 145 | 0,3% | 1.693.500 | € 140 | € 135 | 0,3% |
| 2+ pers 65- [>2x mod] | 1.073.700 | € 190 | € 190 | 0,3% | 1.215.300 | € 185 | € 180 | 0,3% |
| | | | | | | | | |
| 65+ [<=min] | 32.700 | € 155 | € 150 | 0,7% | 133.200 | € 115 | € 105 | 0,6% |
| 65+ [min-mod] | 273.600 | € 155 | € 150 | 0,8% | 903.100 | € 115 | € 105 | 0,6% |
| 65+ [1 - 2x mod] | 157.700 | € 185 | € 180 | 0,5% | 283.100 | € 155 | € 150 | 0,5% |
| 65+ [>2x mod] | 70.500 | € 255 | € 250 | 0,5% | 89.500 | € 230 | € 225 | 0,4% |
| TOTAL | 3.543.400 | € 165 | € 160 | 0,4% | 6.408.000 | € 140 | € 130 | 0,3% |

*Table 2 (Continued)*

The data is obtained from a research on housing needs in 2002 (Wbo 2002). The amount of the user part property tax for houses was part of the survey, so I was able to calculate average property taxes for these groups. The expected income effect in that case just equals the user part of the property tax for houses (the part which was abolished in 2006) divided by the average income of that specific group. As the table shows, households with low incomes pay less property tax as households with higher incomes. This makes sense, since low income households will own or rent on average less expensive houses (remind that the amount of property tax is a percentage of the property value). But low income households spend a higher percentage of their income on property taxes since income raises faster as the amount of property tax. So, the abolishment of the user part of the property tax will benefit the low income households relatively more.

Another topic here is the differences between tenants and owners of a house. In all income groups, homeowners pay substantially more property tax. This is because homeowners' houses are worth more as tenants houses. The table also shows that the imposed property tax is higher for all income groups as the property tax paid. This difference is especially large for low income tenants, because in this group a large share receives remittance. There are only very few remittances for higher incomes. For homeowners, the difference between property tax paid and imposed property tax is negligible. This means that only very few homeowners receive remittances. Altogether, the abolishment had on average a positive income effect of 0,3 percent. For some groups, the income effect is equal to 0,8 percent while for the highest income group of tenants it is only 0,2 percent. Next to that, for those households whose municipal taxes are remitted their income did not change, since they did not pay any property tax in practice before.

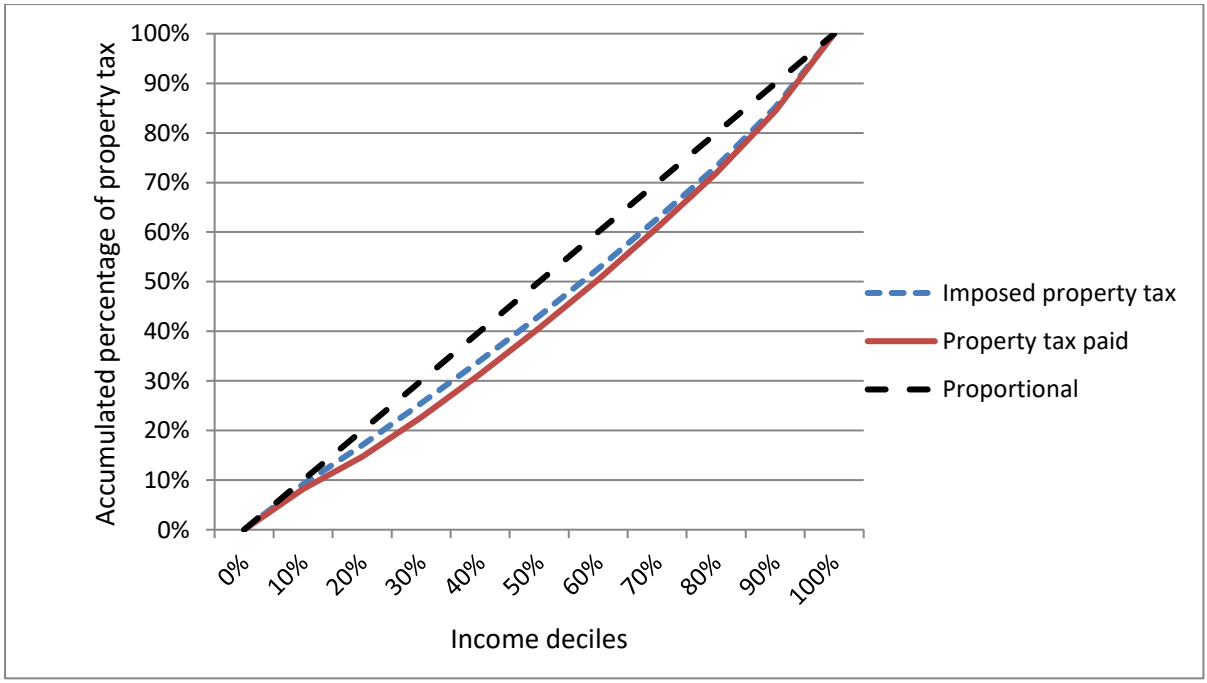


*Figure 5: Lorenz curve of user part property tax. Source data: Wbo 2002*

To further show the distributional effects of this user part of the property tax I divided the households into income deciles. Table 3 shows the amounts of user part property tax for houses that households payed on average in 2002. What stands out is the fact that the lowest income decile pays a higher amount of property tax as the second and third income decile. This can be explained by the fact that there are relatively many elderly people and relatively many owner-occupied houses in that income decile. Despite the first income decile, the other income deciles follow the distribution one would expect: the amount of property tax paid increases per income decile.

| Income decile | tax paid |
|---|---|
| 10% | € 105,43 |
| 20% | € 84,36 |
| 30% | € 102,37 |
| 40% | € 111,83 |
| 50% | € 119,41 |
| 60% | € 125,62 |
| 70% | € 134,81 |
| 80% | € 141,87 |
| 90% | € 160,82 |
| 100% | € 201,37 |
| Average | € 130,93 |

*Table 3: Average property tax (user part) for houses paid per household in 2002 (in euros). Source data: Wbo 2002.*

One measure I use is the Lorenz curve. The Lorenz curve depicted in figure 5 shows the share of tax revenue per income decile. In the case of a perfectly proportional tax, the curve is equal to the reference line. The figure shows the imposed property tax as well as the property tax paid. The Lorenz curve for the user part of the property tax is below the reference line. This means that lower income groups pay a smaller share of the total amount of property tax. As stated before, this makes sense since households with lower incomes will own or rent on average less expensive houses and thus pay less property tax. The 'property tax paid' line is a little closer to the reference line as the 'imposed property tax' line. This adds up since especially low income households profit from the remittances. These are the households whose amount of property tax paid is lower as their imposed property tax.

Next to that I calculated the Gini coefficient for the property tax paid. The Gini coefficient turned out to be 0.13 where 0 means complete proportionality and 1 means that the household with the highest income pays all the tax. The Gini coefficient is just the ratio between (i) the surface between the Lorenz curve and the proportionality line and (ii) the whole surface below the proportionality line. A Gini coefficient of 0.13 means that the tax revenues are distributed rather proportional among the income deciles. This figure and the Gini coefficient inform us about the *absolute* distribution of the tax but do not take the income into account; and thus do say anything about the relative distribution of the tax.

A measure which does take this into account is the Suits index (Suits, 1977). It is one of the most widely used indexes to measure the *progressivity* of taxes (Anderson, 2003). Figure 6 shows the corresponding Suits curve. The graph is different as the Lorenz curve. The x-axis in the graph represents the share of total income. This is a different definition as is used in the Lorenz curve; in the Lorenz curve 10 percent means the 10 percent of households with the lowest incomes. In Figure 6, 10 percent represents those households with the lowest income who earn together 10 percent of total income. So this represents more than 10 percent of households. The y-axis represents the share of total revenues from the user part of the property tax. For example, these individuals who earn about 3 percent of the total income (these are the lowest 3 percent in the income distribution) pay for 10 percent of the total revenues from the user part of the property tax. Again, the reference line represents a hypothetical tax which is exactly proportional. When the Suits curve lies above the reference line, this means that the tax is *regressive*; the share in the total revenues from the tax is higher than the share in total income. In other words, households with lower incomes spend a higher share of their income on this tax as higher income households. From the figure it follows that this is the case for the user part of the property tax for houses. The Suits curve lies above the reference line. This means that, for example, those households with the lowest incomes who earn together 20 percent of total income, pay for slightly less than 40 percent of the user part of the property tax. This is in line with the results from table 1; lower income groups spend a larger share of their income on this tax (the owner part of the property tax). In 2006 this tax was abolished completely at once. These results suggest that it where the lowest income groups which profited the most from the abolishment of this tax. Again I consider the imposed property tax and the actual property tax paid. The imposed property tax lies above the property tax paid line which means that the former is slightly more regressive as the latter. This is because especially lower incomes profit from the remittances. So, for these household the imposed property tax is high, but the property tax actually paid is low.

Next to that I calculated the Suits index for this tax which turned out to be equal to -0.22157. The negative number implies that the tax is regressive. A Suits index of 0 means that the tax is perfectly proportional and a Suits index of -1 imply that the household group with the lowest income pays all the taxes. Therefore, a Suits index of -0,22157 is rather regressive. Concluding, the ex-ante distribution of the user part of the property tax leads to the expectation that households with high incomes profit the most from the abolishment of the tax in absolute numbers, but low income households will profit the most relatively (as a share of their income).

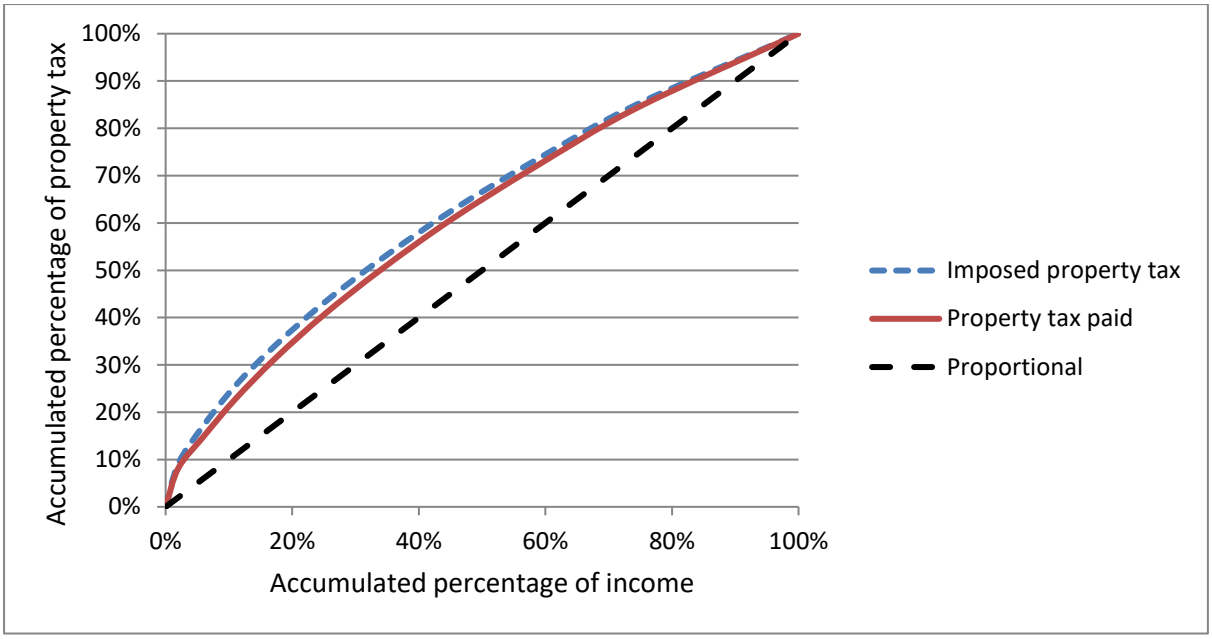


*Figure 6: Suits curve of user part property tax. Source data: Wbo 2002*

### *3.1.2 Ex-post income effects among households*

Based on the distribution of the property tax among income groups we can argue that the abolishment of the tax should benefit lower incomes relatively more. To strengthen this claim, I also estimated the difference in total community taxes payed among income groups. I compared the total municipal taxes and fees from 2002 with those from 2006. Figure 7 describes this change in total municipal taxes. This figure shows that especially the higher income deciles faced a large decrease in total municipal taxes. These groups profited, at least in absolute numbers, the most from the tax reform. The only exception to this pattern is the first income decile. The first income decile profits from a decrease of around 65 euros per capita, while the decrease per capita for the second income decile is only 40 euros. The highest income deciles saw a decrease in their total municipal taxes of 120 euros per capita.

The numbers in figure 7 represent the *absolute* change in euros. Figure 8 describes the *relative* effects of the tax reform. It represents the *income effect*, which means that the change in total municipal taxes is divided by the corresponding average income. In this way, we get the effect of the tax reform per income decile expressed in percentage of their income. Figure 8 shows that especially the first income decile had a large income effect of more than 0,8 percent. The second income decile faced a smaller effect of less than 0,3 percent. The income effect gets slowly smaller per income deciles until it is only slightly more than 0,1 percent for the highest income decile. To conclude, the picture of the ex-post income effects is the same as for the ex-ante income effects: although the highest income groups profited the most from the tax reform in *absolute* terms, the lower income groups profited the most *relative*ly.

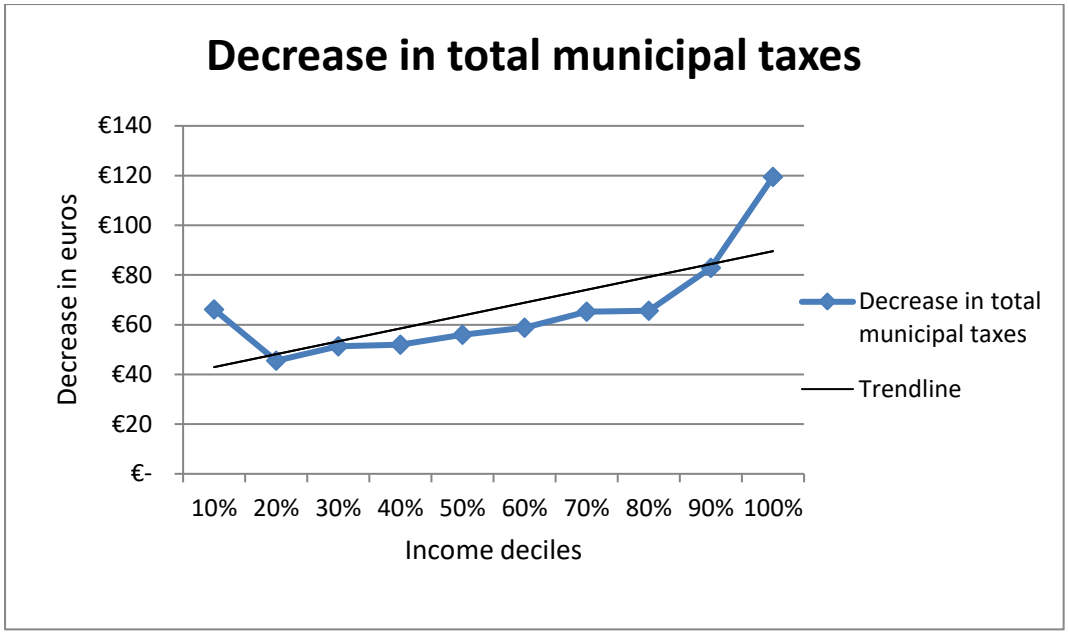


*Figure 7: Decrease in total municipal taxes per capita between 2002 and 2006 per income decile. Numbers of 2002 are corrected for inflation and are thus in 2006 euros. Data sources: Wbo 2002 and WoON 2006.*

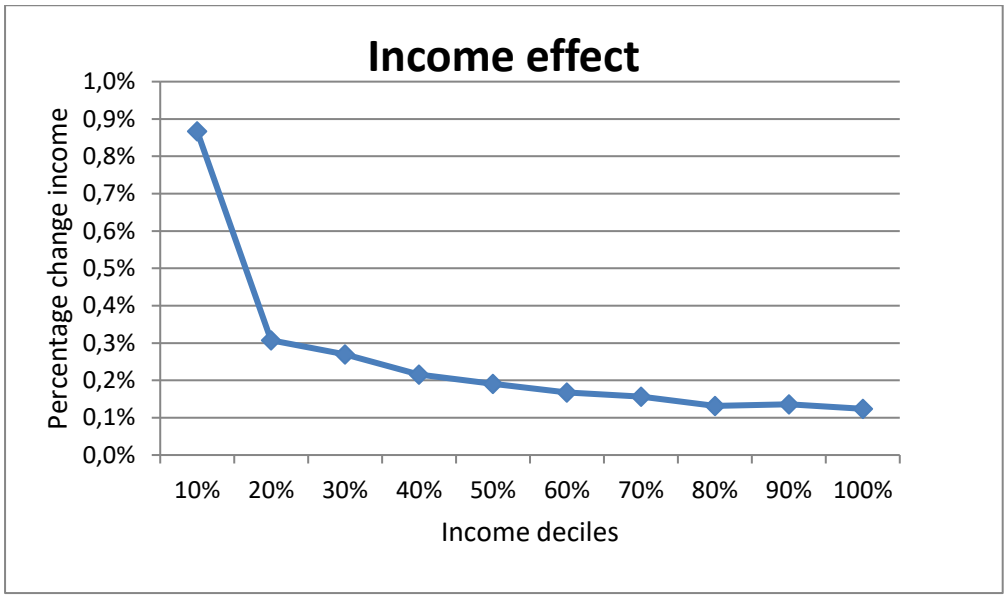


*Figure 8: Ex-post income effect of the abolishment of the user part property tax. These numbers are obtained by dividing the difference in total municipal taxes by the average income per income decile. Source data: Wbo 2002 and WoOn 2006.*

*3.2 Income effects among municipalities*

The previous part of this section discussed the income effects among households. This part studies the income effects among municipalities. As figure 9 shows, municipalities faced different income effects due to the tax reform. It illustrates the impact of the tax reform on the municipal budgets across the Netherlands. What becomes clear from this picture is that especially municipalities in the North lose from this policy, while municipalities in the center of the Netherlands and the islands are more often net profiteers.

| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **panel A: Netherlands** | **decile** | **income** | **user part property - tax 2002** | **change in total municipal taxes (2006-2002)** | **Proportion realised - decrease in taxes** | **House value 2006** | **Change in general grant relative to average** | **house value: if 50% capitalisation** | **house value: if full capitalisation** | **Income effect (50%)** | **Income effect (100%)** |
| | 1 | € 7.178 | € 105 | € 66 | 60% | € 175.491 | € -1,25 | € 175.528 | € 175.564 | 1,4% | 1,9% |
| | 2 | € 13.930 | € 84 | € 45 | 51% | € 151.637 | € -1,53 | € 151.674 | € 151.710 | 0,6% | 0,8% |
| | 3 | € 17.937 | € 102 | € 51 | 50% | € 159.752 | € -1,49 | € 159.788 | € 159.825 | 0,5% | 0,7% |
| | 4 | € 22.673 | € 112 | € 52 | 48% | € 164.878 | € -0,52 | € 164.915 | € 164.951 | 0,4% | 0,6% |
| | 5 | € 27.557 | € 119 | € 56 | 48% | € 174.935 | € -0,72 | € 174.972 | € 175.009 | 0,3% | 0,5% |
| | 6 | € 32.925 | € 126 | € 59 | 51% | € 186.050 | € -0,25 | € 186.087 | € 186.124 | 0,3% | 0,4% |
| | 7 | € 39.202 | € 135 | € 65 | 51% | € 200.814 | € 0,02 | € 200.851 | € 200.888 | 0,3% | 0,4% |
| | 8 | € 46.735 | € 142 | € 66 | 49% | € 215.516 | € 0,38 | € 215.554 | € 215.591 | 0,2% | 0,3% |
| | 9 | € 57.522 | € 161 | € 83 | 53% | € 240.603 | € 0,78 | € 240.640 | € 240.678 | 0,2% | 0,3% |
| | 10 | € 90.712 | € 201 | € 119 | 61% | € 318.590 | € 4,62 | € 318.629 | € 318.669 | 0,2% | 0,2% |
| | Total: | € 34.613 | € 131 | € 70 | 54% | € 200.067 | € 0,00 | € 200.104 | € 200.141 | 0,3% | 0,4% |
| **Panel B: Randstad** | | | | | | | | | | | |
| | 1 | € 8.074 | € 93 | € 44 | 42% | € 176.374 | € 2,92 | € 176.412 | € 176.451 | 1,0% | 1,5% |
| | 2 | € 13.940 | € 74 | € 18 | 24% | € 152.157 | € 3,04 | € 152.195 | € 152.234 | 0,4% | 0,7% |
| | 3 | € 17.901 | € 92 | € 25 | 29% | € 156.951 | € 2,35 | € 156.989 | € 157.027 | 0,4% | 0,6% |
| | 4 | € 22.675 | € 102 | € 26 | 29% | € 161.465 | € 4,64 | € 161.505 | € 161.544 | 0,3% | 0,5% |
| | 5 | € 27.540 | € 111 | € 35 | 31% | € 170.286 | € 3,73 | € 170.325 | € 170.364 | 0,3% | 0,4% |
| | 6 | € 32.866 | € 121 | € 36 | 34% | € 184.552 | € 4,68 | € 184.591 | € 184.630 | 0,2% | 0,3% |
| | 7 | € 39.167 | € 133 | € 50 | 39% | € 201.386 | € 5,10 | € 201.426 | € 201.466 | 0,2% | 0,3% |
| | 8 | € 46.792 | € 140 | € 51 | 39% | € 216.461 | € 5,50 | € 216.501 | € 216.541 | 0,2% | 0,3% |
| | 9 | € 57.576 | € 158 | € 67 | 43% | € 240.119 | € 4,90 | € 240.159 | € 240.199 | 0,2% | 0,3% |
| | 10 | € 92.858 | € 204 | € 111 | 55% | € 334.121 | € 11,21 | € 334.164 | € 334.206 | 0,2% | 0,2% |
| | Total: | € 36.261 | € 127 | € 53 | 42% | € 202.606 | € 4,69 | € 202.645 | € 202.685 | 0,3% | 0,4% |
| **Panel C: Non-Randstad** | | | | | | | | | | | |
| | 1 | € 6.761 | € 111 | € 74 | 65% | € 174.984 | € -3,38 | € 175.019 | € 175.055 | 1,6% | 2,1% |
| | 2 | € 13.924 | € 90 | € 59 | 61% | € 151.311 | € -4,20 | € 151.347 | € 151.382 | 0,7% | 0,9% |
| | 3 | € 17.955 | € 107 | € 63 | 57% | € 161.407 | € -3,56 | € 161.443 | € 161.478 | 0,5% | 0,7% |
| | 4 | € 22.671 | € 116 | € 63 | 55% | € 166.852 | € -3,26 | € 166.887 | € 166.923 | 0,4% | 0,6% |
| | 5 | € 27.565 | € 123 | € 64 | 53% | € 177.502 | € -2,91 | € 177.537 | € 177.573 | 0,4% | 0,5% |
| | 6 | € 32.952 | € 128 | € 68 | 57% | € 186.852 | € -2,57 | € 186.888 | € 186.924 | 0,3% | 0,4% |
| | 7 | € 39.218 | € 136 | € 71 | 55% | € 200.503 | € -2,37 | € 200.539 | € 200.575 | 0,3% | 0,4% |
| | 8 | € 46.709 | € 143 | € 72 | 54% | € 214.995 | € -2,02 | € 215.031 | € 215.067 | 0,2% | 0,3% |
| | 9 | € 57.493 | € 162 | € 92 | 59% | € 240.891 | € -1,33 | € 240.928 | € 240.964 | 0,2% | 0,3% |
| | 10 | € 89.313 | € 200 | € 125 | 66% | € 307.157 | € 0,51 | € 307.195 | € 307.232 | 0,2% | 0,2% |
| | Total: | € 33.806 | € 133 | € 78 | 60% | € 198.621 | € -2,39 | € 198.657 | € 198.693 | 0,3% | 0,4% |

*Table 4: Differences between Randstad and other parts of the Netherlands. Sources data: Wbo 2002, WoON 2006*

Table 4 compares municipalities in the Western part of the Netherlands called the *Randstad* with municipalities from the others parts of the Netherlands. The Randstad is that part of the Netherlands in the west which includes, among others, the four largest cities of the country. A strict definition of the Randstad would imply that only the four largest cities in the Netherlands together form the Randstad (i.e. Amsterdam, Rotterdam, The Hague and Utrecht). I decide to use a broader and more accurate definition of the Randstad by Musterd and De Pater (1994) who define the Randstad as two urban areas; the southern wing (which includes among others The Hague, Rotterdam and Leiden) and the northern wing (including for example Utrecht, Amsterdam and Haarlem).

Table 4 shows that the average income is about 2.500 euros higher in the Randstad as in the other parts of the Netherlands. On the other hand, households in municipalities outside the Randstad payed a higher amount of user part property tax in 2002 as households in the Randstad, although the difference is only small (i.e. 5,50 euros per year). Next to that, municipalities outside the Randstad decreased their local taxes more as municipalities within the Randstad. Total municipal taxes declined with about 53 euros per year in the Randstad between 2002 and 2006. Outside the Randstad it declined with almost 78 euros between those years; a substantial higher decline as in the Randstad. This difference is remarkable since the difference in the user part of the property part between the Randstad and the other parts of the Netherlands is very small (i.e. less than 6 euros on average). This suggests that municipalities in the Randstad were either compensated more for the abolishment of the user part of the property tax or that they raised other municipal taxes more as municipalities in the other part of the Netherlands.

Municipalities were compensated for this loss of income by a change in the general grant from the municipality fund. Column 8 compares the compensation (i.e. the change in general grant) between the income deciles in the Netherlands and the other parts of the Netherlands relative to the average of 74,26 per capita. It shows that the municipalities in the Randstad are indeed compensated more than municipalities in the other parts of the Netherlands. Municipalities in the Randstad receive on average almost 5 euros more than the average per capita, while municipalities outside the Randstad receive more than 2 euros less than average per capita. The compensation is determined by the average house value in the municipalities and column 7 already shows that the house value in 2006 in the Randstad is higher as the average house value outside the Randstad. But it is remarkable since the average amount of user part property tax paid in the Randstad is higher as outside the Randstad. So, municipalities within the Randstad faced a lower income loss because the amount of property tax paid which was abolished is lower as outside the Randstad, but they were compensated more as municipalities outside the Randstad.

### *3.2.1 Capitalization*

The following columns describe two scenarios: one in which the compensation for municipalities capitalizes for 50 percent and one in which there is full capitalization of the compensation into house prices. The next section elaborates why I expect that it is the change in the general grant due to the tax reform that capitalizes in the house prices. In other words, I

expect that due to the compensation (a transfer from the central government to the municipalities) municipalities receive, the house prices increase. Whether and to what extent this capitalization does occur in practice will be discussed extensively in the next section.

Columns 11 and 12 then describe the income effects of these scenarios. The income effect consists of the change in the house value due to the capitalization and the reduction in total municipal taxes. When 50 percent of the compensating change in the general grant capitalizes in the house prices, the average income effect equals 0.3 percent. Especially the first income decile in the other parts of the Netherlands profit from this; their income effect equals 1,6 percent. The scenario where there is full capitalization leads to a slightly higher income effect of 0,4 percent. The first income decile in the other parts of the Netherlands now face an income effect of 2,1 percent.

*3.3 Conclusion*

This section describes the income effects of the tax reform in 2006. The first part studies the income effects among household with different incomes. The ex-ante comparison (based on the amount of user part property tax paid before the reform) suggests that the net profit in absolute terms of the tax reform increases with income. However, in terms of income, the profit of the tax reform decreases with income. Households with a low income spend a larger share of their income on this tax as households with higher incomes, thus the abolishment of this tax induces a higher gain for them. The ex-post comparison (based on the actual change in municipal taxes) shows the same picture. Households with low incomes profit less in absolute terms, but more in relative terms compared to households with higher incomes.

The second part studies the income effects among municipalities and is insightful in the difference between municipalities in the Randstad and municipalities in the other parts of the Netherlands. Total municipal taxes outside the Randstad decreased more as within the Randstad. This is remarkable since the amounts of property tax paid before the reform is comparable and the compensating change in the general grant is on average higher for municipalities in the Randstad as for municipalities in the other parts of the Netherlands. The resulting income effects of this tax reform are more or less the same for households living in the Randstad as for households living in other parts of the Netherlands.

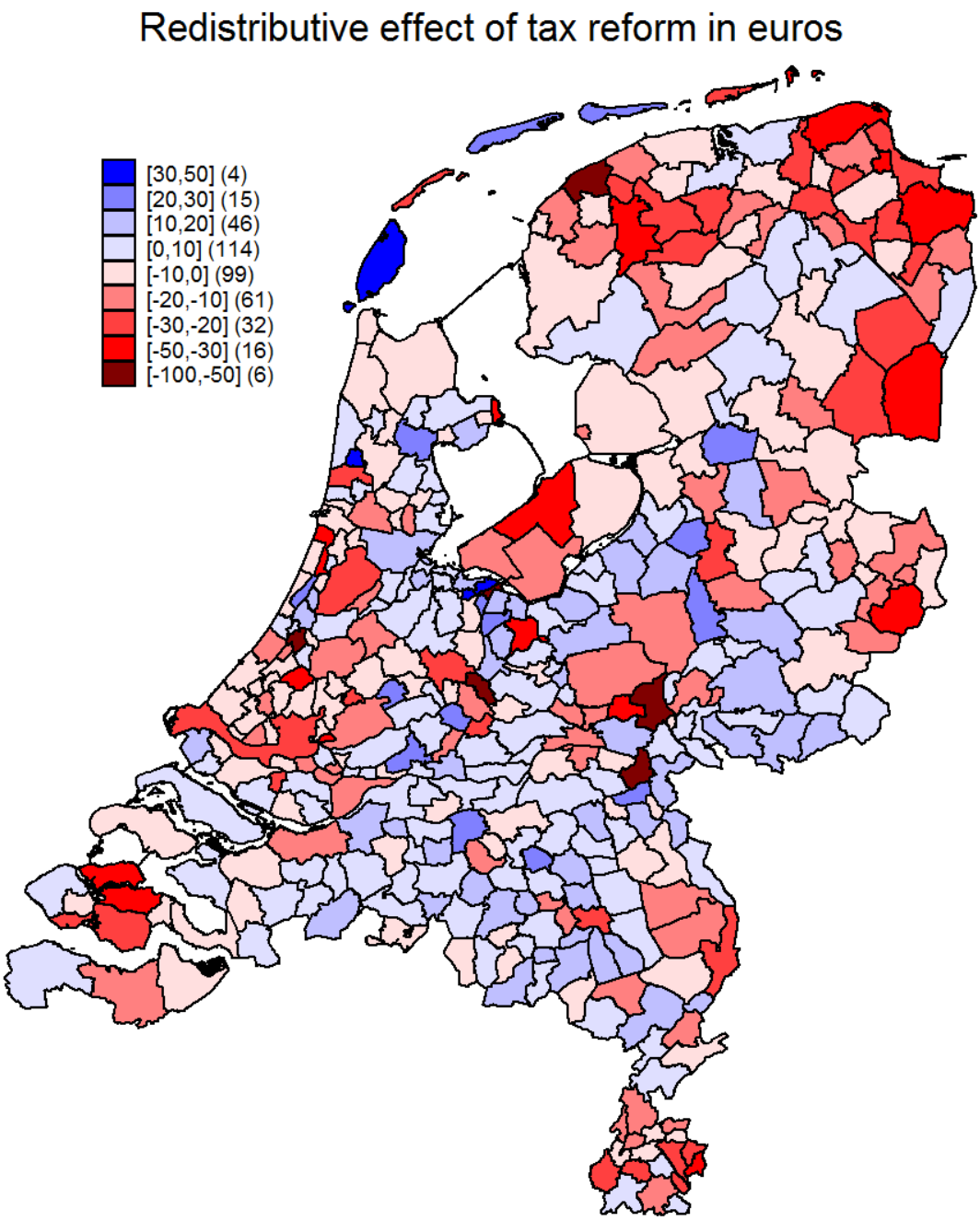


*Figure 9: Redistributive effect of tax reform on municipal budgets*

## 4. Related literature

There are three other studies which examine the effect of central government grants on house prices. Hilber et al. (2011) study the effect of central government grants on house prices in England using panel data. To overcome the endogeneity issue, they employ an instrumental variable approach. They utilize electoral targeting of grants to municipalities by the incumbent national government as an instrument which provides the exogeneous variation. Both the IV-regressions and the OLS with fixed effects lead to the conclusion that the central government grants are fully capitalized in the house prices. Allers and Vermeulen (2016) study the effect of a change in the central government grants system on the house prices in the Netherlands. As in Hilber et al. (2011) they use an OLS regression with fixed effects as well as an instrumental variable approach. The nonlinear time pattern of the reform allows them to control for municipality-specific linear trends in unobserved variables. Both specifications lead to full capitalization of the change in central government grants in house prices. A third study to examine the impact of central government grants on house prices is Barrow and Rouse (2004). They study the effect of state grants to local authorities for school spending on house prices in the US to examine whether adults value the level of the money spent on education. Consistent with the previous studies, they use an OLS-specification with fixed-effects and an IV-specification. Both the OLS and the IV specification show a significant positive relation between central government grants and house prices.

There exists a wider range of studies which examine the capitalization of other kinds of local public spending in house prices. The seminal paper in this field of research is that of Oates (1969). He finds a significant *negative* relation between property taxes and house prices and a significant *positive* relation between local public spending and house prices. He finds that these two categories are capitalized almost fully into house prices. Chaudry-Shah (1988) and Ross and Yinger (1999) have reviewed the empirical evidence in the years after the study by Oates. Both reviews discuss the literature on the capitalization of local public spending as well as the capitalization of property taxes. Ross and Yinger conclude that practically all studies find a significant negative effect of property taxes on house prices. The capitalization rate differs and ranges from 15 to 100 percent. Concerning the capitalization of local public spending, they conclude that there is evidence for capitalization, but that the literature in inconclusive. Also in more recent years, the capitalization of property taxes has been studied. An important study is done by Palmon and Smith (1998). He argues that most of the previous literature is plagued by spurious correlation between public services and taxes. He tries to overcome this problem and finds full capitalization of property taxes in house prices.

The capitalization of different kinds of local public spending is studied in several papers. There exist, for example, strong support for the capitalization of education quality in house prices. Hilber and Mayer (2009), Reback (2005) and Figlio and Lucas (2004) recently studied this issued and all find evidence for the capitalization of school spending in house prices. Next to that, there is also evidence for the capitalization of impact fees[10] (Ihlanfeldt & Shaughnessy, 2004). Finally, there is evidence for the capitalization of local tax incentives for

[10] Impact fees are one-time fees for property owners.

employers (Hanson, 2009). He uses an OLS and an IV-specification and finds a large statistically significant effect. Concluding, there exists a large literature about the capitalization of different kinds of local public spending and property taxes. My main contribution lies in adding evidence to the small set of papers which study the effects of central governmental grants on house prices.

## 5. Empirical analysis of capitalization

### *5.1 Theoretical Framework*

This section explores the possible capitalization of the tax reform into house prices. Hilber et al. (2011) explain the theoretical framework for studying the impact of intergovernmental grants on house prices. They elaborate on the theoretical framework developed in Brueckner (1979) (1982). The mechanism works in the following way. Municipalities provide local public services which they finance through a local property tax. The objective of municipalities in this model is to maximize the house values. Households are freely mobile between municipalities and bid for houses. They are willing to increase their bid until the utility from a house in a certain municipality equals that of what they can achieve elsewhere. This utility is determined by the house price, the level of local public services and negatively by the property tax. Because utility is determined by these factors (in other words, households take the level of local public services and the property tax rate into account in their location decision), the marginal willingness to pay for local public services and the property tax are capitalized fully into house prices.

Because the marginal willingness to pay for local public services and the property tax capitalizes in house prices and municipalities want to maximize the house values, they set its public expenditures such that the tax needed to finance this would just offset the aggregate willingness to pay for it (i.e. it meets the *Samuelson condition*).

Now, consider the tax reform of 2006. In this reform, the user part of the property tax for houses was abolished. In other words, municipalities may now collect less property taxes and can therefore provide less public services. However, at the margin, the willingness to pay for local public services equals the cost of providing them (i.e. the property tax). So, the capitalized tax decreases with approximately the same amount as the capitalized willingness to pay for them. Thus, the abolishment of the user part of the property tax leaves the house prices unchanged.

But, next to the abolishment of the user part of the property tax for houses, the tax reform also consisted of a compensating change in the general grant for municipalities. This additional grant increases the municipalities' budget; it can provide more local public services without having to raise the property tax. If the level of expenditures is optimal, then it does not matter whether the municipality uses the additional grant to raise the level of local public services or to lower property taxes. In both cases, the model predicts that the additional grant capitalizes fully in the house prices (remind that the utility for a household for living in a certain

municipality is determined by the house price, the level of local public services and the property tax). Concluding, according to this theoretical framework the change in the general grant due to the tax reform capitalizes fully in the house prices.

*5.2 Data*

This section about the capitalization of the tax reform into house prices uses panel data which includes among others the house prices per municipality between 1996 and 2015. The house price in this dataset is a hedonic house price estimated using the average *actual transaction price corrected for national features*. This means that the price is corrected for differences in house characteristics in the Netherlands. Using transaction prices has the disadvantage that some smaller municipalities have only a few transactions per year. Municipalities which had in a certain year in the estimation period less than 20 transactions and municipalities with missing data in one or more years are excluded. This leaves us with a sample of 340 municipalities. In total, the data contains almost 2 million transactions, which equals on average 253 transactions per municipality per year. This dataset is combined with panel data which includes, among others, the general grant per municipality, the change in the general grant due to the tax reform and the supplementary grant for the period 2005-2015. The change in general grant due to the tax reform and the change in the general grant added with the supplementary income are the two instruments used in this study. The former instrument represents the extra money municipalities receive from the Municipality Fund, while the latter represents the net change in transfers from the central government to the municipality. Both the change in the general grant and the supplementary grant are expected to capitalize since both grants are 'windfall' profits for the municipalities. They differ because the change in the general grant is *permanent*: municipalities receive every year the additional money through the general grant. The supplementary grant is only *temporarily* and is gradually phased out within approximately 20 years. This makes the effect of the supplementary grant only marginal. The house prices, supplementary grants and general grants are corrected for inflation (i.e. converted to 2015 euros) using the consumer price index (Statistics Netherlands, 2017).

An issue using municipal data from the Netherlands is the amalgamations of municipalities. Where in 1996 the Netherlands consisted of 625 municipalities, in 2015 this number is only 393 (Statistics Netherlands, 2017). This is due to a substantial number of mergers of municipalities. As in the previous section, I use the municipalities of the year 2015. So, in the case of a merger between 3 municipalities, I use the new large municipality for the whole period.

Figure 10 describes the relation between the change in the general grant and the supplementary grant. The figure describes two municipalities, Bussum (which profited the most per capita from the tax reform) and Leiden (which faced the largest net income loss per capita due to the tax reform). The dashed lines represent the change in general grants due to the tax reform in 2006. This is equal to zero until 2005 and from 2006 onwards it remains constant. The solid lines represent the change in general grant added with the supplementary grant. For Bussum, this line lies below the dashed line. This is because Bussum is a net profit municipality and has to pay money to the supplementary scheme. The solid line is upward

sloping from 2006 onwards since the supplementary scheme was gradually phased out. For Leiden, the opposite occurred. The solid line (which represents the change in general grant added with the supplementary grant) reaches its peak in 2006 since Leiden is a net loss municipality and receives a supplementary grant. This supplementary grant was phased out gradually and thus the solid line declines after 2006. So, the change in the general grant due to the tax reform is a one-time occurrence in 2006. The change in the general grant added with the supplementary grant equals zero before 2006 and changes on yearly basis after that year.

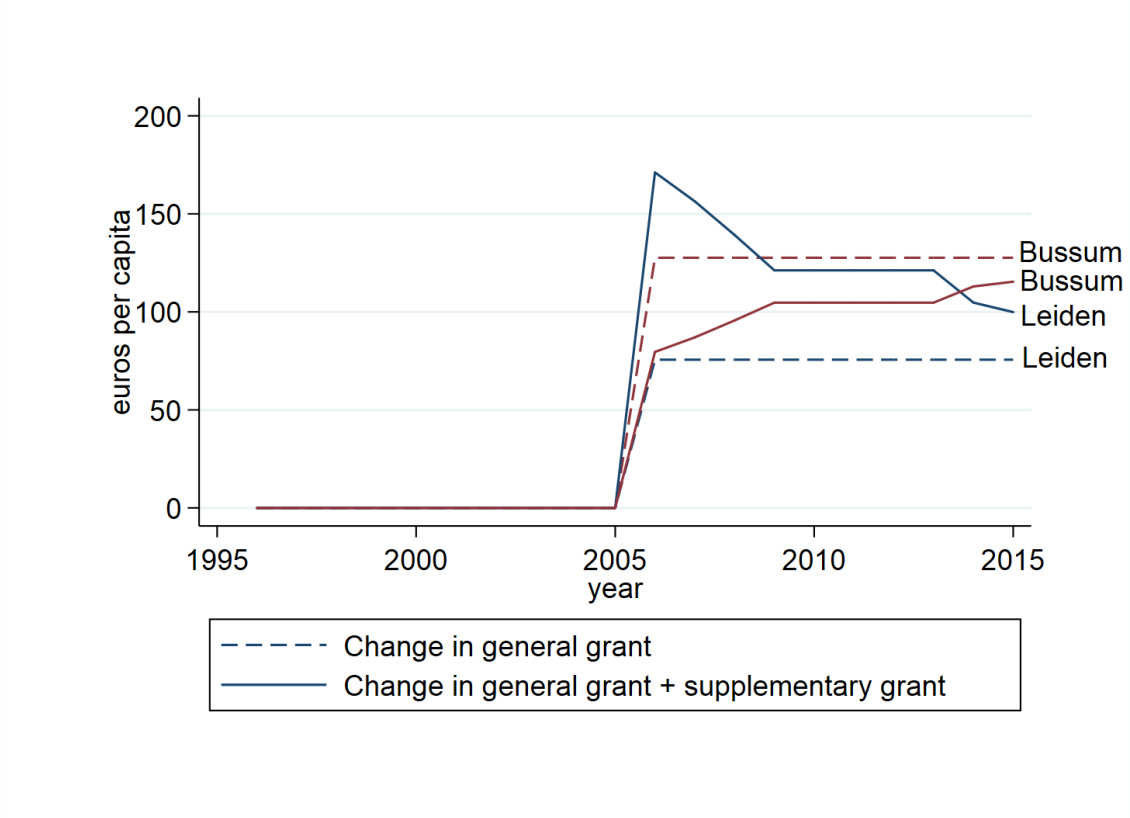


*Figure 10: Change in general grant and supplementary grant for the municipalities of Leiden and Bussum. Prices are in nominal values.*

As figure 10 shows, the change in general grant due to the tax reform differs among municipalities. Figure 11 scatters the level of the change in the general grant against the trend in house prices. The fitted line shows that there is indeed a positive correlation. This is important, since it shows that endogeneity might be an issue. More precisely, endogeneity here means that even *without* capitalization there would be a positive correlation between the change in the general grant and the change in house prices after the reform. In other words, also without capitalization municipalities with a large change in general grant have larger increase in house prices. We hypothesize that it is the change in the general grant which capitalizes in the house prices. When those municipalities with already a strong positive trend before the reform, receive a relatively large general grant this might bias the results due to endogeneity. In the next part, describing the identification strategy I will explain how this study deals with the endogeneity issue. Figure 12 shows the geographical distribution of the change in general grant due to the tax reform among the municipalities. A blue color corresponds to an above increase in the general grant while a red color corresponds to increase in the general grant which is

below the average. The figure shows that especially municipalities in the north saw their general grant increasing below average, while municipalities in the western part and the middle of the Netherlands had an above average increase in the general grant. Consistent with figure 11, these municipalities in the western part of the Netherlands are the municipalities with the steepest positive trend in house prices. So, also figure 12 confirms this correlation.

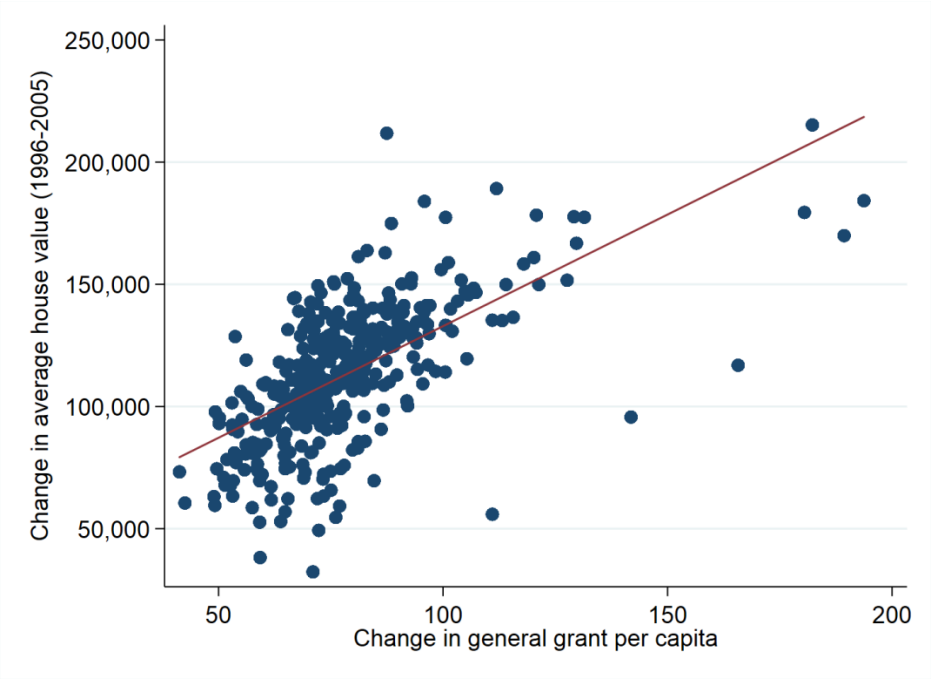


*Figure 11: Correlation between the change in general grant and trend in house prices per municipality.*

| | Obs. | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| House price 1996 | 388 | € 170.967 | 34378 | € 76.980 | € 262.398 |
| House price 2005 | 388 | € 289.322 | 56417 | € 145.329 | € 456.735 |
| House price 2015 | 388 | € 241.050 | 70317 | € 104.387 | € 532.757 |
| Change in general grant | 7760 | € 42 | 45 | € - | € 226 |
| Change in general grant + supplementary grant | 7760 | € 43 | 46 | € - | € 289 |
| Supplementary grant | 7760 | € 1 | 8 | € -56 | € 111 |

*Table 5: Descriptive statistics.*

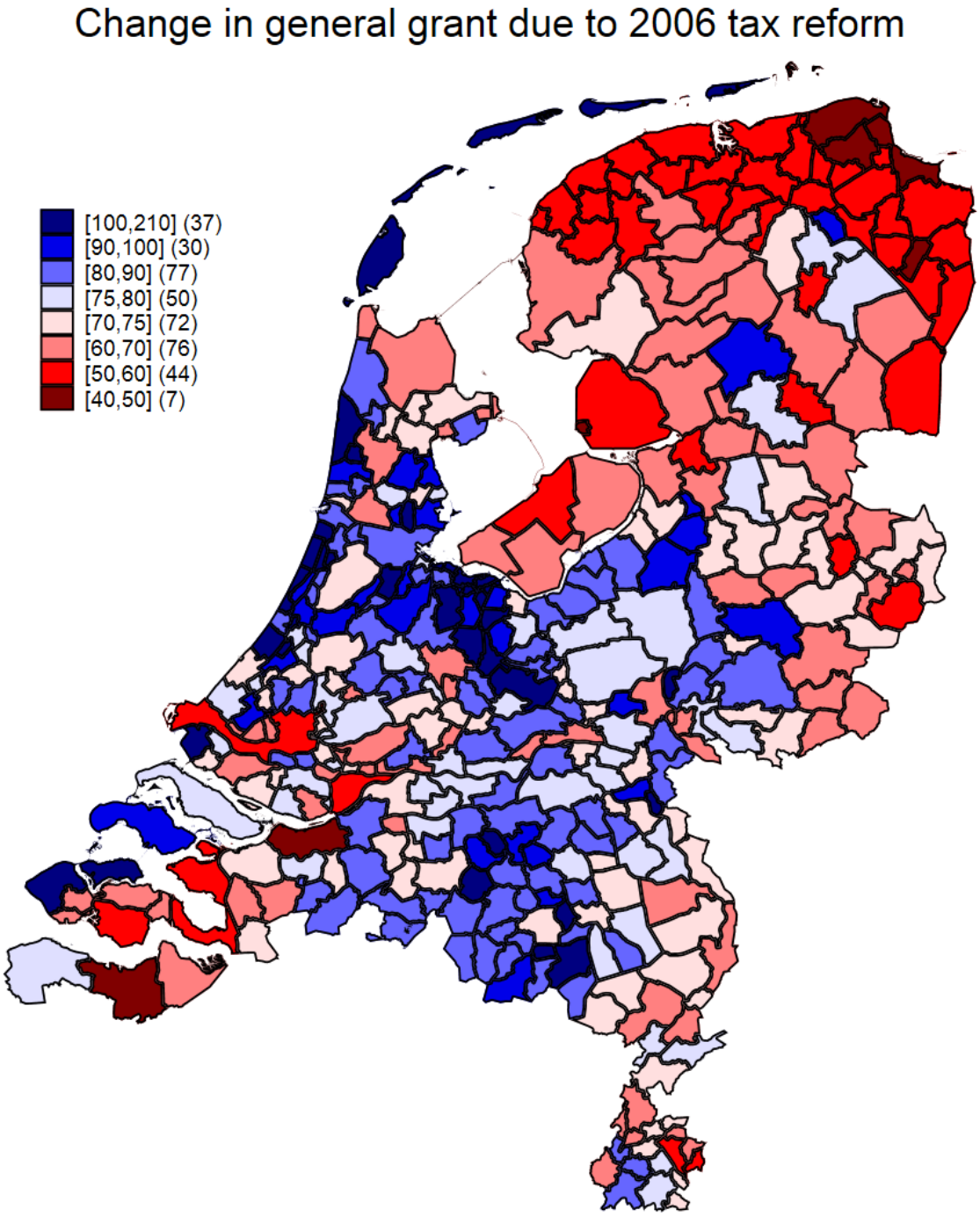


*Figure 12: Heat map of change in general grant due to 2006 tax reform*

*5.3 Identification strategy*

I estimate the effect of the tax reform on house prices using a *fixed effects* specification. This specification controls for time trends, time-invariant differences between municipalities and allows for municipal-specific time trends. The following specification is the baseline specification:

$$\log(P_{i,t}) = \alpha_i + \beta_t + \gamma_i t + G_{i,t-2} + \varepsilon_{i,t},$$

where the dependent variable $\log(P_{i,t})$ is the log of the hedonic house price, $\alpha_i$ is a municipality fixed effect, $\beta_t$ is a year fixed effect, $\gamma_i t$ is a municipal-specific linear time trend and $G_{i,t-2}$ is the independent variable of interest. In this specification this independent variable is the *level of the general grant*. The municipal-specific time trends controls for differences in time trends in municipalities. As discussed above, these differences and the correlation with the level of the change in general grant might lead to endogeneity. By explicitly controlling for different municipal time trends, I deal with the endogeneity. This specification is the *reduced-form* of the instrumental variable approach described hereafter.

I use the *log* of the house price index for the estimation of the effect of the tax reform on the house prices. This is in line with other studies which estimate the capitalization of central government grants into house prices (Allers & Vermeulen, 2016) (Hilber, Lyytikäinen, & Vermeulen, Capitalization of central government grants into local house prices: Panel data evidence from England, 2011). The advantage of this *semi-log specification* is that it minimizes the relative deviation of predicted from observed house prices, which makes it less sensitive to outliers as linear models. The independent variable (i.e. the level of the general grant) in all specifications is lagged two years. The reason is that it takes time before municipalities have changed the municipal tax rates or the local public service level due to the political process. Standard errors are clustered at the municipal level.

*5.3.1 Instrumental variable approach*

Next to the fixed effects specification, also an *instrumental variable* approach is used. In this specification, the level of the general grant is instrumented on the change in the cluster 'own income' of the general grant. The cluster 'own income' of the general grant from the municipality fund was adjusted in 2006, as part of the tax reform, to compensate for the income loss due to the abolishment of the user part of the property tax for houses[11]. However, every year several clusters are adjusted for various reasons. Thus, for example the total change of the general grant in 2006 was not only due to the discussed tax reform, but also due to other reasons. The first stage estimates the effect of the change in the general grant due to the tax reform on the level of the general grant:

$$\hat{G}_{i,t-2} = \alpha_i + \beta_t + \gamma_i t + G(OI)_{i,t-2} + \varepsilon_{i,t},$$

[11] In this paper, except for this part of the section I refer to the change in the 'own income' cluster as the change in the general grant due to the tax reform.

where the dependent variable $G_{i,t-2}$ is the level of the general grant, lagged two years and $G(OI)_{i,t-2}$ the change in the general grant due to the adjustment of the 'own income' cluster. The second stage estimates the effect of this change on the house prices:

$$\log(P_{,t}) = \alpha_i + \beta_t + \gamma_i t + \hat{G}_{i,t-2} + \varepsilon_{i,t} \ ,$$

where $\hat{G}_{i,t-2}$ represents the level of the general grant, estimated in the first stage. Consistent with the fixed effect regression, I will use a lag of 2 years for the main independent variables. Standard errors are clustered again at the municipal level.

## 6. Results

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| **Second stage** | Log of house price | Log of house price | Log of house price | Log of house price |
| Lag(2) of level of general grant | 5.58e-05*** | 9.65e-05*** | 0.000546*** | 0.000402*** |
| | (2.06e-05) | (2.09e-05) | (7.78e-05) | (6.89e-05) |
| Kleibergen-Paap F statistic | | | 77,021 | 97,258 |
| **First Stage** | | Dependent variable: | Lag(2) of level of general grant | |
| Change in general grant | | | 1.028*** | |
| | | | (0.161) | |
| Change in general grant + supplementary grant | | | | 0.577*** |
| | | | | (0.135) |
| R-squared | 0.915 | 0.953 | 0.875 | 0.875 |
| Observations | 340 | 340 | 340 | 340 |
| Number of municipalities | 6120 | 6120 | 5705 | 5705 |
| Municipal time trends | NO | YES | YES | YES |
| Estimator | OLS | OLS | IV | IV |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

*Table 6: Baseline specifications*

Table 6 shows the results from the baseline specification. Columns (1) and (2) show the results from the fixed effects specifications. Column 1 does not include the municipal-specific time trends, while column 2 does. Both the coefficients are positive and significant at the 1 percent level. Without the municipal-specific time trends, the coefficient is smaller as in the specification including the municipal-specific time trends. For example, a coefficient of 0.000058 implies that a 1 euro rise in the general grant increases the average house price with 12,59 euros with an average weighted house price of 225.706 euro[12].

The results from the instrumental variable approaches show the same picture as the results from column 2. Columns (3) and (4) show the results with two different instruments; the change in general grant due to the tax reform, lagged two years (column 3) and the change in the general grant due to the tax reform added with the supplementary grant, lagged two years

[12] See Appendix table 1

(column 4). Both first stages are positive and strongly significant, the Kleibergen-Paap F statistic is well above the Stock-Yogo critical values (Kleibergen, 2007) (Stock & Yogo, 2005). This implies that the instrument is strong. The first stage for the change in general grant as instrument equals more or less 1. This means that almost all the variation in the level of the general grant can be explained by the change in the general grant due to the 2006 tax reform. Adding the supplementary grant to the instrument makes the coefficient substantially smaller, but the coefficient remains significant. The estimates for the second stage are as well positive and significant at the 1 percent level. The magnitude is large; a coefficient of 0.000546 as in column 3 implies a capitalization rate of more than 150 percent (see Appendix table 2 and corresponding paragraph).

| | **Randstad** | | **Outside Randstad** | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **Second stage** | Log of house price | Log of house price | Log of house price | Log of house price |
| Lag(2) of level of general grant | 0.000346*** | 0.000300*** | 0.000899*** | 0.00230*** |
| | (8.88e-05) | (9.23e-05) | (0.000243) | (0.000667) |
| Kleibergen-Paap F statistic | 136,21 | 141,716 | 21,392 | 18,474 |
| **First Stage** | Lag(2) of level of general grant | | Lag(2) of level of general grant | |
| Change in general grant | 0.948*** | | 0.742*** | |
| | (0.255) | | (0.181) | |
| Change in general grant + supplementary grant | | 0.629*** | | 0.190 |
| | | (0.178) | | (0.153) |
| R-squared | 0.937 | 0.939 | 0.882 | 0.881 |
| Observations | 1071 | 1071 | 4480 | 4480 |
| Number of municipalities | 60 | 60 | 280 | 280 |
| Municipal time trends | YES | YES | YES | YES |
| Estimator | IV | IV | IV | IV |
| Average change in general grant per capita | € 104,12 | € 104,12 | € 88,22 | € 88,22 |
| Robust standard errors in parentheses | | | | |
| *** p<0.01, ** p<0.05, * p<0.1 | | | | |

*Table 7: Estimates for municipalities in the Randstad and other parts of the Netherlands separately*

Next to that, I divide the data into two parts: (i) municipalities within the Randstad and (ii) municipalities outside the Randstad[13]. Table 7 shows the estimates for the municipalities within the Randstad (columns 1 and 2) and the municipalities outside the Randstad (columns 3 and 4). The estimates for the municipalities in the Randstad show roughly the same pattern as the estimates for the full sample: strong and significant first stages with Kleibergen-Paap F statistics above the critical values. As in the baseline specification, the coefficient for the first stage with the change in general grant as instrument is about equal to 1, while including the supplementary grant to the instrument lowers the coefficient. The second stages for the Randstad estimates are somewhat lower as for the Netherlands as a whole as in table 6. The implied capitalization rate is slightly lower as 100 percent for these specifications.

[13] I use the same definition of the Randstad as in section 3.

The estimates for the municipalities outside the Randstad show a little different picture. The first stage for the change in general grant as instrument is positive and strongly significant. The Kleibergen-Paap F statistic is just above its Stock-Yogo critical value of 16.38. The first stage for the change in general grant added with the supplementary grant is insignificant. The second stages of both specifications are significant. The coefficient for the Randstad is high; it leads to an implied capitalization rate of over 260 percent. This table shows that the results are driven for a large part by the municipalities outside the Randstad; there the effect seems to be larger as within the Randstad. The estimation with municipalities which received an above and below average change in general grant separately confirms this result (see Appendix table 3). Appendix table 3 shows that the effect is smaller for the municipalities which received an above average change in general grant as for the whole sample. The first stages for the estimates with only municipalities with a below change in general grant are both insignificant and the Kleibergen-Paap f statistics are below the critical values. Therefore, we cannot interpret the coefficients of the second stage. Remind that Randstad municipalities received relatively often an above average change in the general grant. The significance of the first stage also disappears when the top 20 percent of the municipalities in terms of change in general grants is excluded. This implies that the municipalities with the largest change in general grant are needed to get a significant first stage and that the results are driven for a large part by those municipalities.

*6.1 Estimates for different time periods*

As robustness check the instrumental variable approach is estimated for different time periods. Figure 13 shows the coefficients for the second stage estimates with change in general grant as instrument. The time period differs; for example, the coefficient stated at 2010 is that coefficient estimated for the period 1996-2010. As the figure shows, the estimates are robust for different time periods. The coefficient as well as the confidence interval does barely differ over time. The coefficient remains between 0.0005 and 0.0006 which means that the implied capitalization rate is around 150 percent.

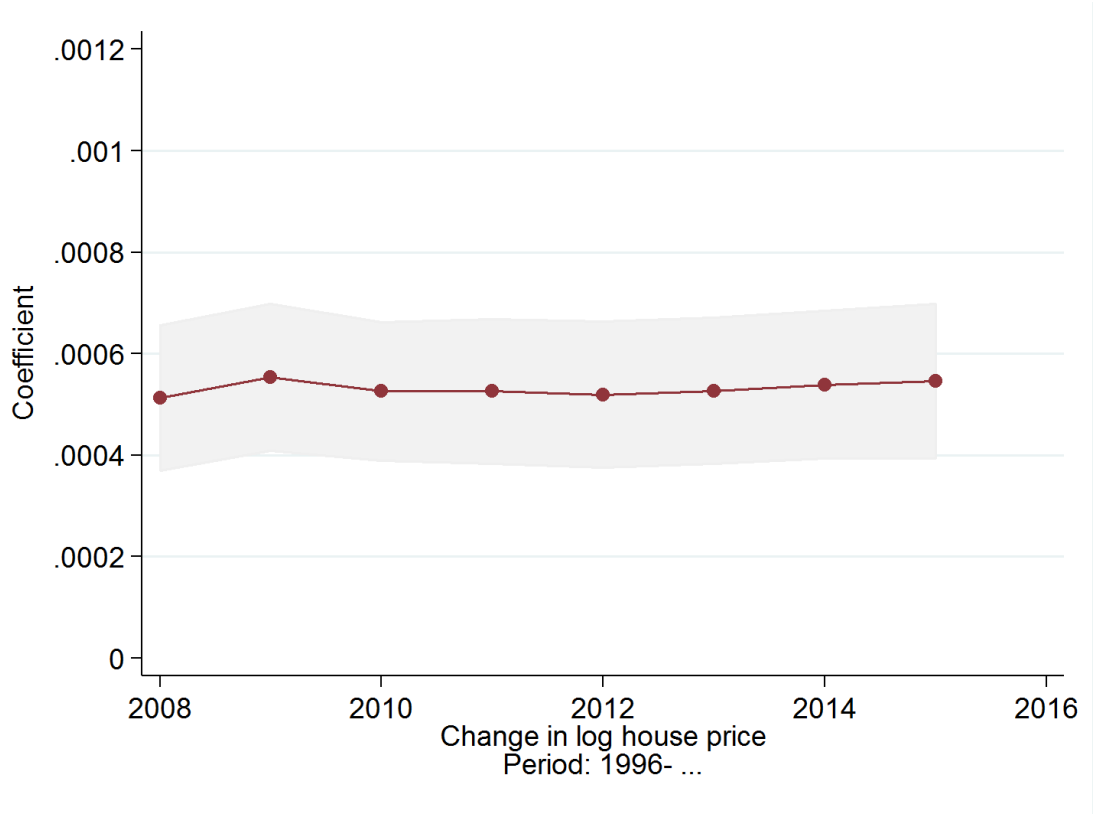


*Figure 13: Graph of coefficients using different time periods. Estimator: Instrumental variable approach. Instrument = change in general grant*

This also applies for the case when the change in general grant added with the supplementary income is used as instrument. In that case, as figure 14 shows, the coefficients are very stable: they differ between 0.0003 and 0.0004. This means that the implied capitalization rate is around 100 percent. So, the results are stable across different time periods.

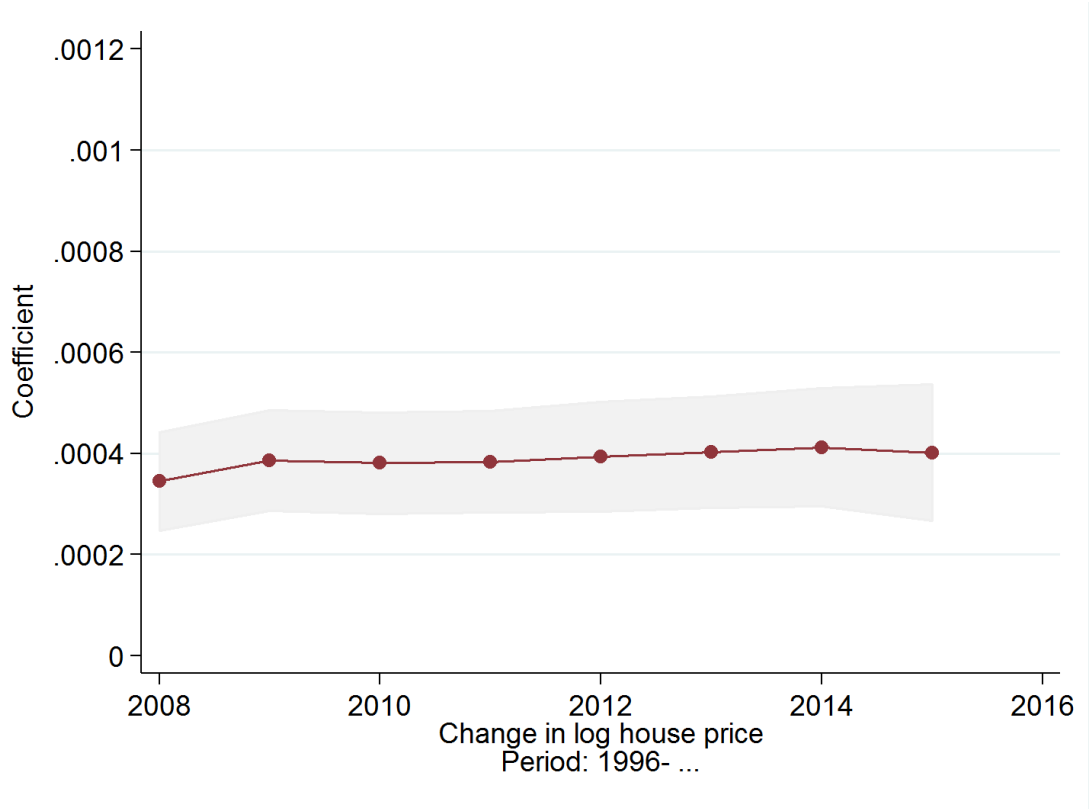


*Figure 14: Graph of coefficients using different time periods. Estimator: Instrumental variable approach. Instrument = change in general grant + supplementary grant.*

## 7. Conclusions

The tax reform in 2006 which abolished the user part of the property tax for houses meant a large shift in the finances of Dutch municipalities. Municipalities got fewer responsibilities in collecting taxes and became even more dependent on transfers from the central government. The ability to change the amount of local taxes in order to provide the desired level of local public services declined. This study shows that municipal taxes indeed declined substantially. However, this decline is not as large as expected because municipalities raised other municipal taxes. Comparing the income effects among different income deciles I found that the low income profited the most from this tax reform in terms of percentage of their income, although the high incomes profited the most absolutely. This study further shows that the addition to the general grant due to the tax reform capitalized in the house prices entirely. This result is obtained using a fixed effects specification and an instrumental variable approach. Both approaches show the same result, which strengthens the validity of the conclusion. The capitalization rate is even more than 100 percent. This result is mainly driven by those municipalities with a high change in the general grant. A capitalization rate of more than 100 percent can be explained by the fact that municipalities are constrained in their ability to collect taxes. Only a small fraction of their revenues consist of local taxes, so municipalities do not have a lot of possibilities to collect taxes at their preferred rate. Therefore, municipalities might provide less local public services as optimal. For that reason, in the case of *underprovision* of

local public services, an additional euro spent on local public services is worth more as 1 euro. So, next to the income effects among households, the tax reform also induced different utility effects among municipalities. Municipalities received higher additional changes in the general grant and therefore, different utility effects arose. Next to that, a redistributional effect between the Randstad and the other parts of the Netherlands took place. Municipalities within the Randstad profited on average more from the tax reform as municipalities outside the Randstad. So, the tax reform had different effects not taken into account by the policymakers.

## Appendix

*Appendix table 1: Average house values across different time periods*

| Period | Obs. | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| 1996-2015 | 7871 | 225.706 | 69.653 | 53.070 | 545.343 |
| 2002-2015 | 5519 | 248.868 | 60.823 | 99.355 | 545.343 |
| 2006-2015 | 3945 | 256.020 | 64.565 | 99.355 | 545.343 |
| 2002-2010 | 3547 | 251.206 | 58.066 | 104.527 | 545.343 |
| 2002-2012 | 4337 | 251.979 | 59.241 | 104.527 | 545.343 |

*Appendix 2*

To quantify the results I calculate the implied capitalization rate based on the coefficients. The formula used is:

$$Capitalization\ rate = \frac{G_{i,t-2} * average\ house\ value}{\frac{average\ household\ size}{r}} * 100$$

The average household size in the Netherlands for this period equals 2.3 (Statistics Netherlands, 2015). I use a real discount rate $r$ of 3 percent, which is the same as Allers & Vermeulen (2016). The average house value depends on the time period used (see Appendix table 1). The intuition behind this formula is as follows. The coefficient times the average house value gives you the rise in the average house value due to 1 euro change in the general grant. For example, with a coefficient of 0.0004 and an average house value of 225.706 euros, a 1 euro increase in the general grant will lead a higher house price of 90,28 euros. The average household size divided by the discount rate gives the net present value of one euro of the house price per individual. So, the net present value of 1 euro of the house price per individual equals (2,3/0.03)=77 euros. Using this formula, a coefficient of 0,0004 for the period 1996 until 2015 for example leads to a capitalization rate of $\frac{0.0004*225706}{\frac{2.3}{.03}} * 100 = 118\%$. Table 12 shows capitalization rates for different time periods and different coefficients, which makes it easier to interpret the meaning of the coefficients from the previous estimates. When the results from the previous estimates are used to calculate the implied capitalization rate, this leads to high rates of above 100 percent.

| Bèta/Period | 1996-2015 | 2002-2010 | 2002-2015 | 2006-2015 |
|---|---|---|---|---|
| 0,0002 | 59% | 66% | 65% | 67% |
| 0,0003 | 88% | 98% | 97% | 100% |
| 0,0004 | 118% | 131% | 130% | 134% |
| 0,0005 | 147% | 164% | 162% | 167% |
| 0,0006 | 177% | 197% | 195% | 200% |

*Appendix table 2: Capitalization rates for different time periods using different coefficients.*

| | **Below average** | | **Above average** | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **Second stage** | Log of house price | Log of house price | Log of house price | Log of house price |
| Lag(2) of level of general grant | 0.000812*** | 0.000507* | 0.000264*** | 0.000234** |
| | (0.000274) | (0.000276) | (9.92e-05) | (0.000104) |
| Kleibergen-Paap F statistic | 9,181 | 6,538 | 86,276 | 206,778 |
| **First Stage** | Lag(2) of level of general grant | | Lag(2) of level of general grant | |
| Change in general grant | 0.848 | | 1.428*** | |
| | (0.530) | | (0.208) | |
| Change in general grant + supplementary grant | | 0.00639 | | 0.709*** |
| | | (0.196) | | (0.146) |
| R-squared | 0.891 | 0.891 | 0.895 | 0.894 |
| Observations | 3258 | 3258 | 2331 | 2331 |
| Number of municipalities | 200 | 200 | 140 | 140 |
| Municipal time trends | YES | YES | YES | YES |
| Estimator | IV | IV | IV | IV |
| Average change in general grant per capita | € 78,15 | € 78,15 | € 109,21 | € 109,21 |
| Robust standard errors in parentheses | | | | |
| *** p<0.01, ** p<0.05, * p<0.1 | | | | |

*Appendix table 3: Estimates for municipalities with below and above average change in general grant separately.*

| **Second stage** | (1) | (2) |
|---|---|---|
| Lag(2) of level of general grant | 0.00117*** | 0.000575** |
| | (0.000348) | (0.000230) |
| Kleibergen-Paap F statistic | 10,477 | 9,936 |
| **First stage** | | |
| Change in general grant | 0.505 | |
| | (0.384) | |
| Change in general grant + supplementary grant | | -0.0252 |
| | | (0.183) |
| R-squared | 0.889 | 0.889 |
| Observations | 4257 | 4257 |
| Numbe of municipalities | 259 | 259 |
| Municipal time trends | YES | YES |
| Estimator | IV | IV |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

*Appendix table 4: Estimates for sample without top 20 percent of municipalities in terms of amount of general grant.*

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