

Mortgage repayments from tax-exempted intergenerational transfers: subsidizing rich children with rich parents?

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abstract

We study whether an extension of a tax exemption policy on intergenerational transfers increases mortgage voluntary repayments using the mortgage loan level data (LLD) collected by the Dutch Central Bank (DNB). We rely on a policy reform that extends the tax exemption on intergenerational transfers to isolate the casual effects. This extension, that was in play for five quarters in the aftermath of the financial crisis, has increased voluntary repayments. We find that during the period of the extension, mortgage voluntary repayments have significantly increased by 22%. The policy reform was meant to reduce the number of underwater mortgages, at the time more than one third of all Dutch mortgages. The repayments, however, increased mostly for borrowers with relatively low loan to value (LTV) mortgage, implying that the policy reform is more favorable to rich children (possibility with rich parents).

Keywords: indebtedness, voluntary repayments, intergenerational transfers, household balance sheet, loan level data

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1. Introduction

The asset prices crisis that had spread through Europe in the period 2010 to 2013 left more than one third of Dutch borrowers with an underwater mortgage. Given the high share of interest-only debt, that increases solvability risk and is specific for the Netherlands, and the more general negative externalities correlated to excessive indebtedness on consumption (citation) and mobility (citation), the Dutch government decided to intervene. The intervention package included, among others, the possibility to either transfer tax facilities on residual debt on new homes, or to reduce it using additional tax-exempted intergenerational transfers. Our study focuses on this second measure and investigates whether it contributed to reduce indebtedness and for whom, thus helping to eliminate the negative externalities mentioned above.

We study whether the extension of a tax exemption on intergenerational transfers stimulates voluntary repayments on existing mortgages using an administrative panel data that contains almost the whole population of borrowers from Dutch banks. Existing literature shows that usual suspects, such as the level of the interest rate, affect voluntary repayments (Green and Shoven, 1986; Krainer and Laderman, 2011). Little is known, however, about the importance of tax-policies in the domain of intergenerational transfers and mortgage voluntary repayments. This study contributes to fill this gap.

In general, the individual's decision of taking up a mortgage is affected by the available and expected intergenerational transfers. Relying on the positive correlation between individual's homeownership and parental financial support, a sizeable amount of existing literature interprets this as evidence of credit market imperfections, that can also delay purchases, in the form of down-payment requirements. Tax policies on intergenerational transfers are an important determinant of transfers from parents (citation), and therefore affect homeownership decisions, as well as the speed for (voluntary) amortization of the mortgage.³

In the first pathway, the intergenerational transfers from family members alleviate the down-payment constraints. US data shows that intergenerational transfers lead to earlier purchases of more expensive homes with higher down-payment (Engelhardt and Mayer, 1998; Guiso and Japelli 2002; Luea, 2008).⁴ Households that receive transfers may use them as substitutes for private savings, or to buy a more expensive house (or purchase the same budgeted house at an earlier date). The institutional setting affects this process. European data show weak or no evidence that transfers from parents facilitate home ownership of children (Guiso and Jappelli (2002),

³ For instance, van OoijenacMaarten and van Rooij (2016) find that borrowers who rely on parental transfer are less risky.

⁴ Mayer and Engelhardt (1996) reports that around 22 percent intergenerational transfers are used as down payment to purchase a home, and the average transfers occupy around 50 percent of the required down payment. Duffy and Roche (2007) find that between 2000 and 2004, around one-third of households receive an inter vivos transfer and the transfer represented 21 percent of the down payment. For Italy, Guiso and Japelli (2002) report that around 16 per cent of individuals report receiving a gift or financial support earmarked for real estate purchase.

Kolodziejczyk and Leth-Petersen (2013)).⁵ The second pathway is that the (lump-sum) intergenerational transfer may be annuitized (citation). and then used for monthly scheduled mortgage repayments, or simply directly used for a lump-sum voluntary repayment (thereby reducing the remaining mortgage repayments they face). For this pathway, evidence on the impact of intergenerational transfers is more limited (citation).

The lack of literature in this area is possibly connected to the empirical challenges that such investigations face. Intergenerational transfers are possibly caused by the mortgage down-payment or amortization requirements, making intergenerational transfer (partly) endogenous to the mortgage debt. In order to identify the causal effect of the tax policies on debt reductions financed using intergenerational transfers, we use a temporary policy change, that was enacted for a period of five quarters starting in October 2013 and ending in December 2014. During the extension period, the transfer amount increased, anybody could become a donor and the upper limit of beneficiary's maximum age restriction was dropped. Also, huge media coverage was given to it.⁶ To preview our results, the extension increased voluntary repayments by around 3,400 euros when cast in terms of conditional margin (about 15% of mortgage owners made a repayment). Relative the average size of voluntary repayments of 21,000 euro, this implies a relatively large positive effect of 16% on the voluntary repayment. We also find a strong effect on the voluntary repayment rate. The probability of making a voluntary repayment increased by 29% during the policy extension period. This main finding is robust to checks when we narrow sample period or consider alternative definitions of the policy extension.

Distinctive features of this study are the high coverage, frequency and granularity of the data used. We analyze about 80% of all existing mortgages in the Netherlands (about 95% of all those hold by Dutch banks), and are able to follow the extension of the policy from the onset to its exact end. The high granularity, where multiple loans per household are observed in all periods, allows capturing features of indebtedness that have hardly ever been studied before, such as the shares of debt types per borrower and how these evolve over time. This study contributes to the literature because by its clean design allows capturing the causal effect of a change in policy on indebtedness and intergenerational transfers.

The paper is organized as follows. In the next section, we describe Dutch household debt and describe the policy change of the tax exception on intergenerational transfers in the Netherlands. In Section 3, we introduce the data collect by the Dutch central bank and present

⁵ For Italy, Guiso and Jappelli (2002) find that transfers (bequests and inter vivos gifts) have only a small impact on the time spent saving for a down payment. Using a large administrative database in Denmark, Kolodziejczyk and Leth-Petersen (2013) find little evidence that intergenerational transfers are used to support home ownership. There is no evidence that parents transfer resources to children to facilitate home ownership, or insure against labour market shocks around the time that home ownership is entered into. For the Netherlands, around 9% of individuals report receiving financial support for home ownership from parents (Mulder & Smits 2013).

⁶ With the main Dutch newspaper, the NRC, mentioning these tax-free transfers in 13 articles in 2013, prior to the introduction of the new policy (while hardly any attention was given to the subject in 2012)

descriptive statistics. In Section 4, we discuss the main estimation results, and Section 5 offers brief conclusions.

2. Institutional background

2.1 Housing market and mortgage debt in the Netherlands

In the Netherlands, one mostly speaks of indebtedness in relation to mortgage debt. Financial debt is less common (citation). The lack of a down-payment constraint, together with a generous mortgage interest deduction (MID) and high financial innovation (which made non-amortizing loans possible), has made the Netherlands the leading country in the world in terms of LTV (loan to value) ratios.⁷ The Dutch mortgage debt also stands out in the world for a number of peculiar characteristics. In particular, the high share of interest only (IO) loans should be highlighted. Most existing loans do not amortize, as 60% of outstanding mortgage debt was IO at the time of this study. At mortgage borrower level, the share of fully non-amortizing borrowers is about 30%, while about half of the borrowers has a combination of IO-loans with either annuities of saving loans (Mastrogiacomo and Van der Molen, 2015). The fully IO-loans are more common with elderly borrowers, who used them to cash home-equity. Also, IO loans are more often being voluntarily repaid, which is relevant to our study (DNB, 2014).

Household total debt accelerates during economic recessions and thus amplifies their consequences (Mian and Sufi, 2011) and those household in debt are more severe during financial crisis (Renhart and Rogoff). Figure 1 shows household total debt and the decomposition into three types of debt over time in the Netherlands. It is noticeable that mortgage debt is the main part of household total debt (almost 90%), and the proportion remains relative stable. Consequently, total household debt, and its' possible negative consequences, crucially depends on the development of mortgage debt. Therefore, for the Netherlands, monitoring and understanding mortgage debt is crucial.

After peaking in 2012q3, mortgage debt has slightly declined from 2012q4 to 2014q1, resulting in a reduction of household total debt. This reduction is due to the fact that since the 2013q1, it is discouraged to take out an IO mortgage. Meanwhile, house prices have fallen by more than 20% (compared to the peak in the middle of 2008), and the number of transactions dropped too, thus reducing the contribution of the new mortgage debt production in total debt.⁸ The macro-

⁷ While before the housing crisis (started falling after the second quarter of 2008 until the fourth quarter of 2013), it was common to borrow up to 120% of the property value, the Dutch government has imposed progressively lower LTV caps starting from 2013 (when the LTV cap was fixed to 106%) to be reduced to 100% in 2018. DSTI (debt service to income) caps were also sharpened and the MID was sobered down and fully abolished for new interest-only loans (therefore stopping the production of such loans).

⁸ Also, data from the cadastre show that the share of mortgage-free transactions has increased.

economic environment had an effect on the reduction of existing mortgages as well. The low deposit rate (deposits are typically an alternative to mortgage repayments), the partial removal of fees on voluntary repayments by banks, and the temporary extended tax-exemption scheme for gifting repayments, made voluntary repayments of mortgages debt more popular. After 2015, mortgage debt has stayed roughly constant. In general, consumer credit stayed constant while other types of loans increase slightly, mostly due to student debt becoming more common.⁹

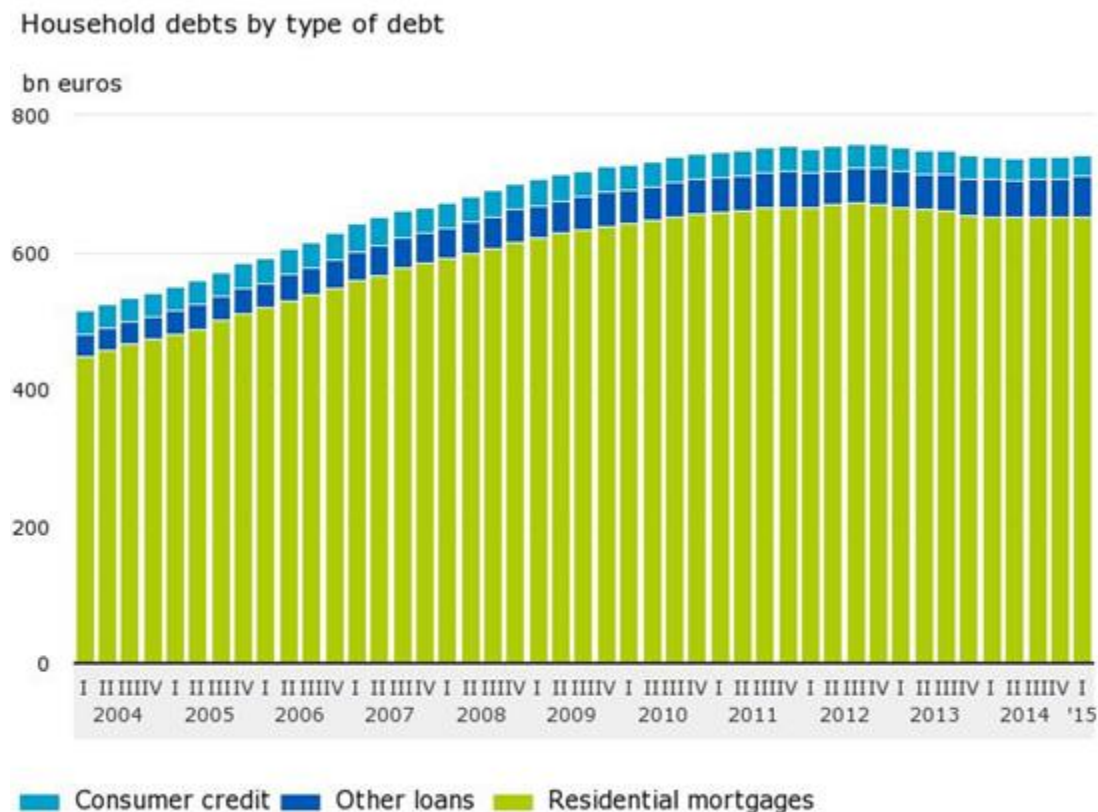


Figure 1. Household total debt and its decomposition.

2.2 Tax on intergenerational transfers and its extension

During the housing crisis in the Netherlands, where prices started falling after the 2008q2 until the 2013q4, consumption contributed negatively to economic growth. The government attempted a number of measures to reduce the negative consequences of excessive indebtedness. Among those measure, two were taken to alleviate the burden of mortgage debt, hoping that this would reduce residual debt (for instance upon selling houses with underwater mortgages). The first was to make residual debt ‘portable’. Those selling a house with negative equity (for instance in order to go rent

⁹ Because of the stop of the student subsidy, students are only eligible to take low interest loans.

somewhere else) were allowed to keep part of the old loan (because of the residual debt after selling) with negative equity, and to benefit of the related mortgage interest rate deduction (MID). The second measure was to temporarily extend a tax exemption policy of gifted repayments. This measure aimed at reducing the negative externalities generated by excessive debt, and is the focus of this study.

In order to make this measure possible, the Dutch government proposed a modification of the law administering succession rights. In the Netherlands, inheritances are taxed. As intergenerational transfers could be a way to elude these taxes, fiscal limits to these transfers apply. Before 1990's, should one receive more than the amount allowed (about 6,000 euro per year), inheritance taxes apply to the excess amount. However, when household indebtedness increased due to the rise of house prices during the 1990's, an additional 46,000 euro one-off lump-sum transfer was allowed. Therefore, before and including 2013q3, for those with age below 35, 52,000 euro in total was allowed as tax-free gift, provided the amount was being used to make a voluntary mortgage repayment¹⁰, buy a new house or make home-improvements.¹¹ This is the most common tax-facilitated intergenerational transfer, but not the only one, as also specific rules apply for instance to tax-payer inheriting the family business or diverting funds from one tax-facilitated savings scheme (of the past) to the other.

In the period between 2013q4 and 2014q4, the regulation facilitating voluntary repayments was temporarily extended. The tax-free amount was lifted from 52,000 euro to 100,000 euro, and the transfers could be received from multiple sources (parents, relatives, friends or anyone else), and the recipient's maximum age restriction was dropped. Also, a lot of publicity was given to this measure in 2013, and banks were requested to directly inform their customers with a letter. After (and including) 2015q1, the tax-free amount was shifted back to 52,000 euro, and the source of transfers is restricted to parents again. However, the recipient maximum age was raised up to age 40.

¹⁰ The remaining mortgage debt should be larger or equal to the amount received.

¹¹ Investing the money on home-improvements also increase the value of a house. Though debt is not reduced directly, but the value of asset increases. If one receives tax-free inheritance, she/he can only repay mortgage debt only once in one's life time.

	Total tax-exempted gifts		Gifts within extended tax-exemption (2013-2014)	
	<i>amount received /10⁶</i>		<i>amount received /10⁶</i>	
	<i>number of receivers</i>		<i>number of receivers</i>	
2012	49 803	2 724	NA	NA
2013	101 871	5 709	40 768	2 704
2014	158 930	9 400	116 325 (73%)	6 987 (74%)
2015*	50 521	3 329	NA	NA

Note: Source from Dutch tax office (belastingdienst). Business equity transfers are excluded.

Table 1: Tax-facilitated intergenerational transfers from tax-records

There is strong evidence that there is a strong increase in the number of users of the tax exemption policy and the amount being received. Table 1 provides information of these transfers was elicited from all tax forms of receivers and has been produced ad hoc by the tax office. The left panel of Table 1 shows a sharp increase in the number of users during the policy extension period in 2013 and 2014, with a total transferred amount increasing from 2.7 to 9.4 billion euro. Also, the right panel of Table 1 shows that this increase in the number and amount is almost exclusively due to transfers falling within the extended tax exemption (both in terms of number of receivers (73%) and transferred amount (74%)).

The upper-left panel of Figure 1 depicts the number of users and upper-right panel depicts the amount received in all tax-free gifts, notwithstanding whether these were meant for mortgage repayments or not. It shows that 2014 was the top year, and in all years, users more often fall in the amount category above 52.000 euro that was being facilitated for the first time, thus shifting the distribution of total transfers to the right. These trends in all transfers are largely shaped by the extended exemption, as shown in the lower-left and lower-right panel of the figure.

The figures produced by the tax-office are however too aggregated to study the characteristics of the receivers, and do not allow for instance to tell about the distributional effects of the measure. Also, microdata on these transfers were never released, so we need to resort to other data sources in order to understand these effects.

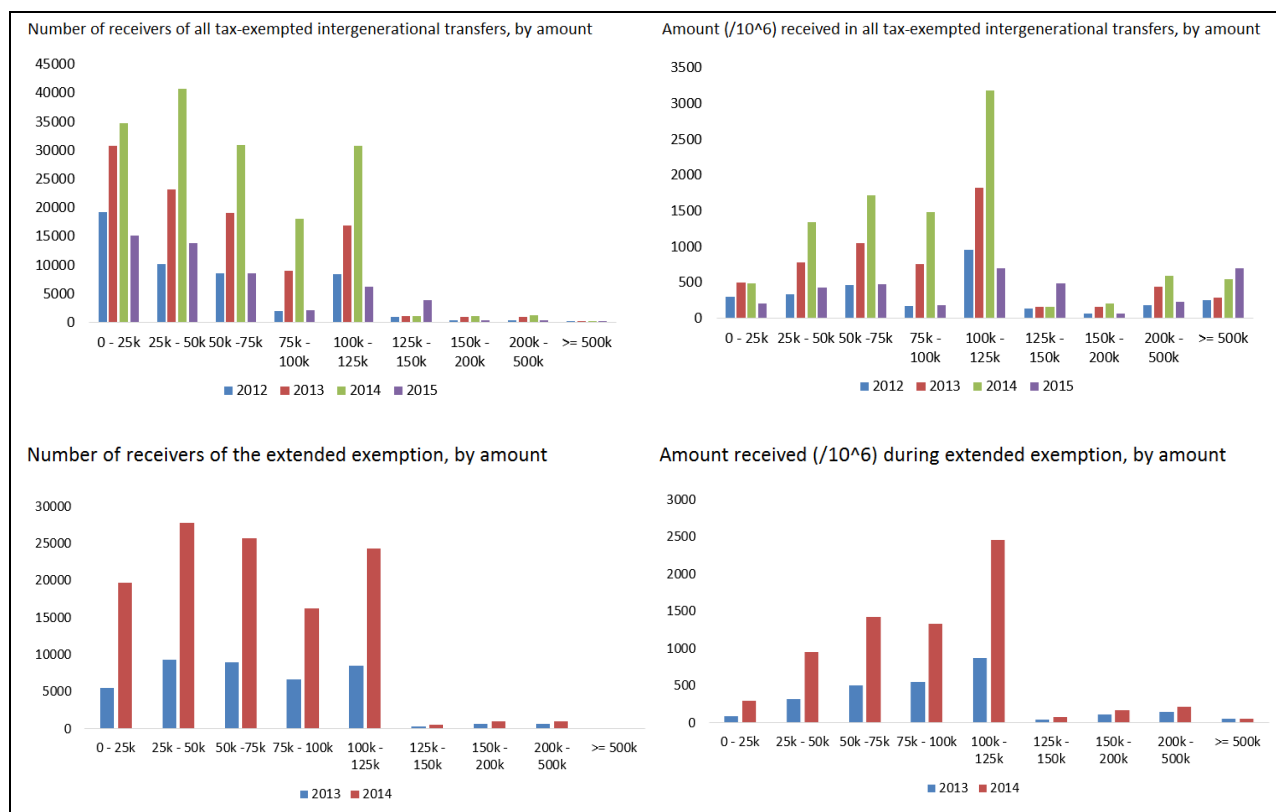


Figure 1: Total tax-exempted intergenerational transfers, users and amounts over time

3. Data and descriptive statistics

3.1 The loan level data

We use the DNB loan level data (LLD) for the period 2012q4 to 2016q1. The LLD is a panel dataset containing quarterly administrative records obtained using the templates that the European Central Bank (ECB) requires for accepting securitised mortgages as collateral.¹² It collects information on about six million loans and three million borrowers (a mortgage typically consists of multiple loans), or approximately 80% of the entire Dutch mortgage portfolio. The administrative nature implies that the dataset has low measurement error. The LLD contains details on the mortgage provider, mortgage type, interest rate, participation into the mortgage guarantee (NHG), origination and maturity and current property evaluation, and all related variables that are required when applying for a mortgage. Additional information is available about the borrower as well, such as his/her age, area code and type of employment at origination. Each record includes a

¹² In order to use a securitized mortgage as collateral, each lending institution must agree to the 100% transparency policy of the ECB and fill in a template meant to deliver data to the European Data Warehouse. While the ECB only requests information on the securitized mortgages, DNB also requests that mortgage lenders report the rest of their portfolio. Dutch pension funds, small banks and insurance companies that do not securitize and foreign institutions do not participate.

unique loan and borrower identifier, which allows tracking them over time if (and only if) the borrowers stay within the same bank.

The LLD also lacks some relevant and important information. In general, we can only observe the borrowers' original income when he/she applies for the mortgage, but not the current income. The LLD contains no information on whether a borrower is a first-time buyer, or the year of inception of debt. Specifically, the main drawback of this study in the data is that we cannot distinguish the provenience of the money used for mortgage repayments. Intergenerational transfers, personal household savings, or some exogenous sources such as lottery winnings or normal inheritances, all qualify, but we cannot identify them. This is true for mortgage repayments and also for intergenerational transfers used as down-payment when borrowers buy a house. That is why we resort to study the changes in the policy design in order to identify the effect of such these transfers. Furthermore, we do not directly observe voluntary repayments, and we have to derive a proxy of it using the panel nature of the data, which means that we can only identify the variable for those who do not transfer their mortgage to a different bank in between two adjacent quarters, which is however a rare event.

3.2 Define voluntary mortgage repayments

The main variable in our study is voluntary repayments. As mentioned in Section 3.1, we cannot directly observe them directly, thus, we need to derive a proxy of voluntary repayments based on a dynamic analysis of the data. We compute the first difference of the amount of loan outstanding¹³ at each wave. A number of issues arise during the dynamic analysis.

First, not all reductions in principals should be considered as voluntary repayments. Annuity and linear loans are contractually repaid each period for an amount that increases over the course of the loan. Close to origination these amounts are low, while interest payments are high, while the opposite is true close to maturity. These contractual repayments must be excluded from the voluntary ones. A similar treatment is needed for saving and life-insurance loans, whose deposits are registered similarly in the data as the contractual amortization of annuities.

Second, we elicit contractual amortization by looking at the periodic reductions of debt outstanding over time, but attrition is present in the data. If we were to condition the analysis on the continuous presence in the data for all 14 waves, our sample would shrink enormously. Besides attrition might be selective, as this would typically affect the group of borrowers that are bank-shifters. In order to deal with this problem, we use the high frequency of the data and construct a moving panel with five waves each move, thus containing four transitions within a period of 12

¹³ This include any amounts that are secured by the mortgage and will be classed as principal in the transaction. For example, if fees have been added to the loan balance and are part of the principal in the transaction these should be added. Excluding any interest arrears or penalty amounts.

months. This is needed because if we were to use only two adjacent waves, we would be unable to distinguish drops in loan outstanding due to contractual or voluntary repayments. So, in our definition, a voluntary repayment is an irregularly large drop in the principal. For example, if a borrower has a linear mortgage where outstanding debt is reduced by 1,000 euro each quarter, but in a specific quarter we observe a reduction of 11,000 euro, we assign in that quarter a voluntary repayment of 10,000 euro, and a contractual repayment of 1,000 euro.¹⁴ This basically boils down to imposing as a pre-requisite of our analysis that a borrower stays within the same bank for a period of 15 months. This method also implies that, due to monthly variations in interest rates and in number of days within a month, while using quarterly data, our computations of contractual repayments cannot be exact. This delivers many repayments that are smaller than what most banks would allow. So, we consider voluntary repayments below 2,000 euro equal to zero. Finally, when we identify multiple voluntary repayments above the legislated threshold for yearly gifts, we do not know which repayment is the one that qualifies for the one-off regulation under scrutiny.¹⁵ We assume that only the first observed voluntary repayments is the one that qualifies.

3.3 Descriptive statistics

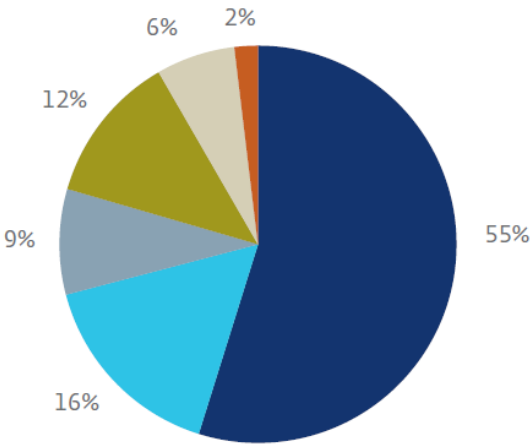
We have mentioned that most mortgage in the Netherlands is IO and that mortgages are typically made by different loan parts. This translates into the debt composition presented in Figure 2. It shows that while IO loans represent 60% of volumes, about 30% of borrowers have no contractual amortization, and 50% of borrowers only has a partial amortization. Voluntary repayments are thus needed by most mortgage owners, if they ever want to repay their debt.

¹⁴ We first round the first difference of the amount of loan outstanding into its nearest number with hundred unit (e.g. 1456.78 into 1500). Then within each consecutive five waves, we find the mode of these five numbers. If the difference between first difference of the amount of loan outstanding and the corresponding mode is larger than 2,000 euro, we identify it as a voluntary mortgage repayment.

¹⁵ The data shows that 20% of the mortgages that makes voluntary repayment contains multiple voluntary repayments

Market shares of mortgage debt outstanding at banks, 2016Q1.

According to mortgage type (at an aggregated level)



According to type of repayment (at the individual debtor's level)

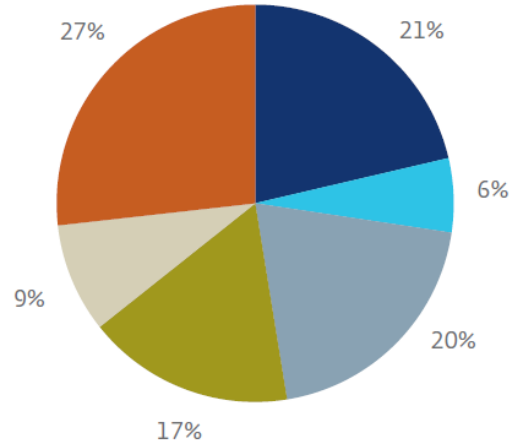


Figure 2: Mortgage debt by loan type, at loan level and at borrower level

Figure 3 summarizes the development of the main variable of interest, voluntary repayments, over the sample period. Two issues are worth noting. First, in this figure, we summarize the changes to the tax exemption scheme of the intergenerational transfers discussed in Section 1. Second, it depicts the development of the national total amount of voluntary mortgage repayments for each wave.¹⁶ We notice that, in comparison to period 2013q1 to 2013q3 (before the regulation was extended), in 2013q4, voluntary repayments start increasing. Also, in 2014 voluntary repayments are much larger, yet dropping in the quarters 2014q1 to 2014q3 possibly because of seasonal reasons (most Dutch households arrange all their financial in the last quarters, when preparing for their tax-reports). The 2014q4 voluntary repayments reach the ever peak, possibly because thereafter the tax-free threshold shifted from to 100,000 euro back to 52,000 euro. During the period 2015q1 to 2016q1, on average, the national total amount of voluntary mortgage repayments remains high, also because by then interest rates on saving deposits had sharply

¹⁶ We have crossed checked our numbers with those reported in the yearly reports of the main Dutch banks, and though we are not allowed to report bank-level figures, we noticed that the numbers matched closely. Also, the aggregate numbers differ slightly from those reported by the tax authority and that we discussed in Section 2.2. This is perfectly plausible, and the LLD should actually deliver somewhat higher figures. This because in the LLD also the voluntary repayments that do not come from intergenerational transfers or do qualify for the tax exemption are reported. These however amount to no more than a couple of millions each year.

dropped, making alternative investments less attractive, we show this in our estimation results later on.

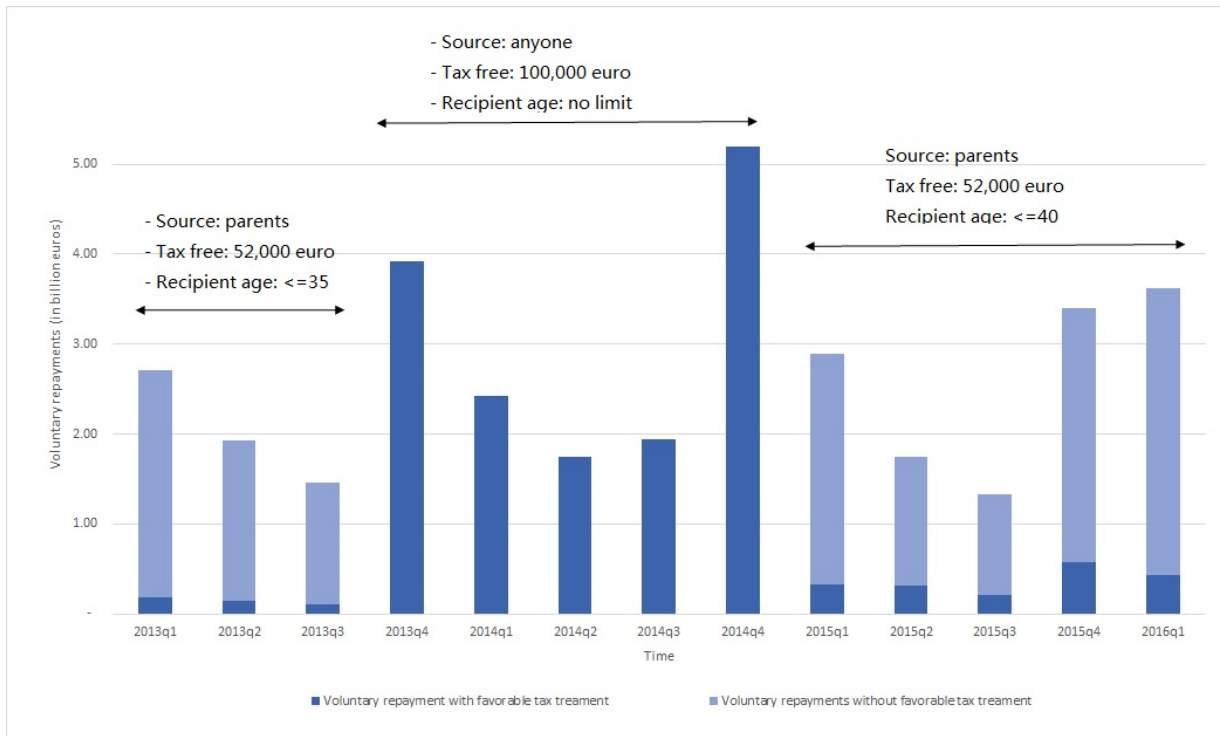


Figure 3, Development of national total amount of voluntary mortgage repayments

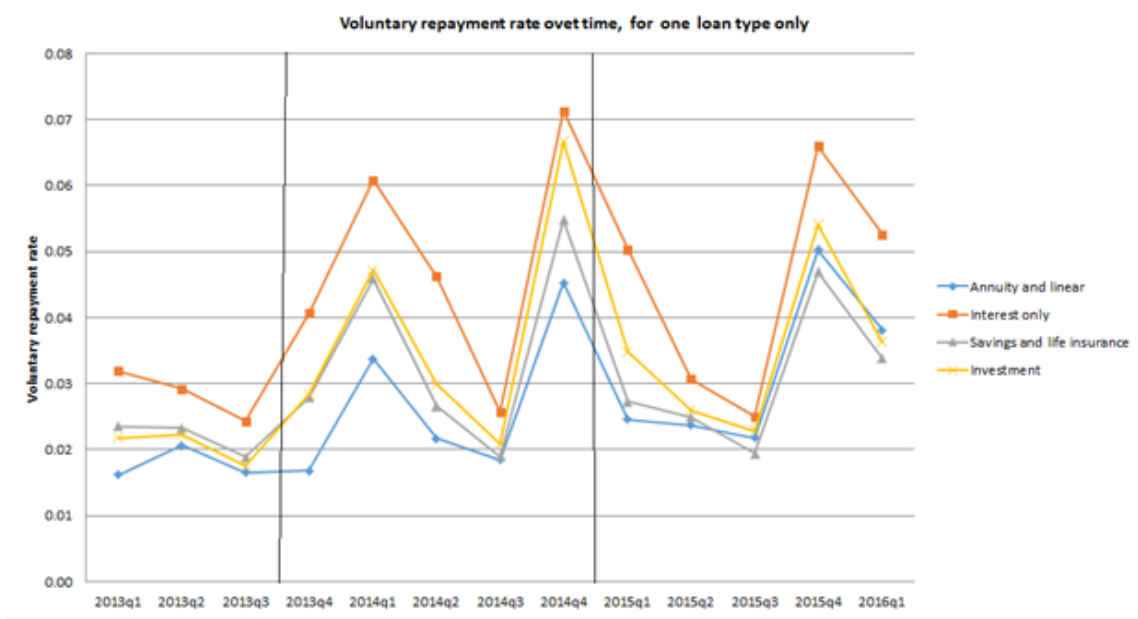


Figure 4, Probability of making voluntary repayment of different types of mortgage, for one loan type only

4. Empirical findings

4.1 Modelling approach

In this section, we use a diff-in-diff (DID) approach to identify the effect of the extended tax exemption on voluntary repayments. Let $DA_{age\leq 35}$ and $DA_{age\leq 40}$ be the dummy variables for the age group younger than 35 and 40, respectively. Let $DT_{time\leq 2013q3}$, $DT_{time\leq 2014q4}$ be two time-dummies indicating the policy extension starting and ending time, respectively. We define three treatment indicators. As indicated in Figure 5, let $TreatmentLow_{it}$ denote the eligibility to the tax exemption from parents below the 52,000 euro threshold, $TreatmentLow_{it}=1$ if

1. $DA_{age\leq 35}=1$ and $DT_{time\leq 2013q3}=1$ (before and include 2013q3, only those below age 35 enjoy the 52,000 euro tax-free benefit), or
2. $DT_{time\leq 2013q3} = 0$ and $DT_{time\leq 2014q4} = 1$ (during the extension period, all citizens still enjoy the 52,000 euro tax-free benefit), or
3. $DA_{age\leq 40}=1$ and $DT_{time\leq 2014q4} =0$ (after the extension period, those below age 40 enjoy the 52,000 euro tax-free benefit).

Let $TreatmentExtra_{it}$ denote the eligibility to the additional 48,000 euro (100,000 – 52,000 euro) tax exemption sourcing from anyone during the policy extension period,

$$TreatmentExtra_{it} = 1 \text{ if } DT_{time\leq 2013q3} = 0 \text{ and } DT_{time\leq 2014q4} = 1.$$

As discussed in Section 2.2, there was intensive publicity was given to this measure in 2013q4. People may be more aware of the importance of making voluntary repayments due to publicity discussion during the beginning of the policy extension period. Therefore, we also expect that there also exists an additional effect caused by the increasing of public awareness. Let $TreatmentPA_{it}$ denote the effect of increasing of public awareness,

$$TreatmentPA_{it} = 1 \text{ if time is 2013q4 (when the tax-free extension was started) and 2014q1.}$$

These three variables are the main variables of interest in the following regression equation:

$$y_{it} = \beta_0 + \beta_1 TreatmentLow_{it} + \beta_2 TreatmentExtra_{it} + \beta_3 TreatmentPA_{it} + \beta_4 Z_t + \gamma X_{it} + \varepsilon_{it} \quad (1)$$

where y_{it} is voluntary mortgage repayments, which is defined in Section 3.2. Time effects are captured by the quarterly macro mortgage interest rates that are included in Z_t .¹⁷ X_{it} contains a set of other explanatory informative variables, which includes age splines to pick up the likelihood

¹⁷ Due to the design of the policy, the treatment effects look very much like time dummies. Using time dummies directly on top of them and when combining with the age/cohort variables would result in a relatively multicollinearity variable.

to receive a donation, cohort dummies as a proxy of capital gains and all other relevant information collected during mortgagee application.

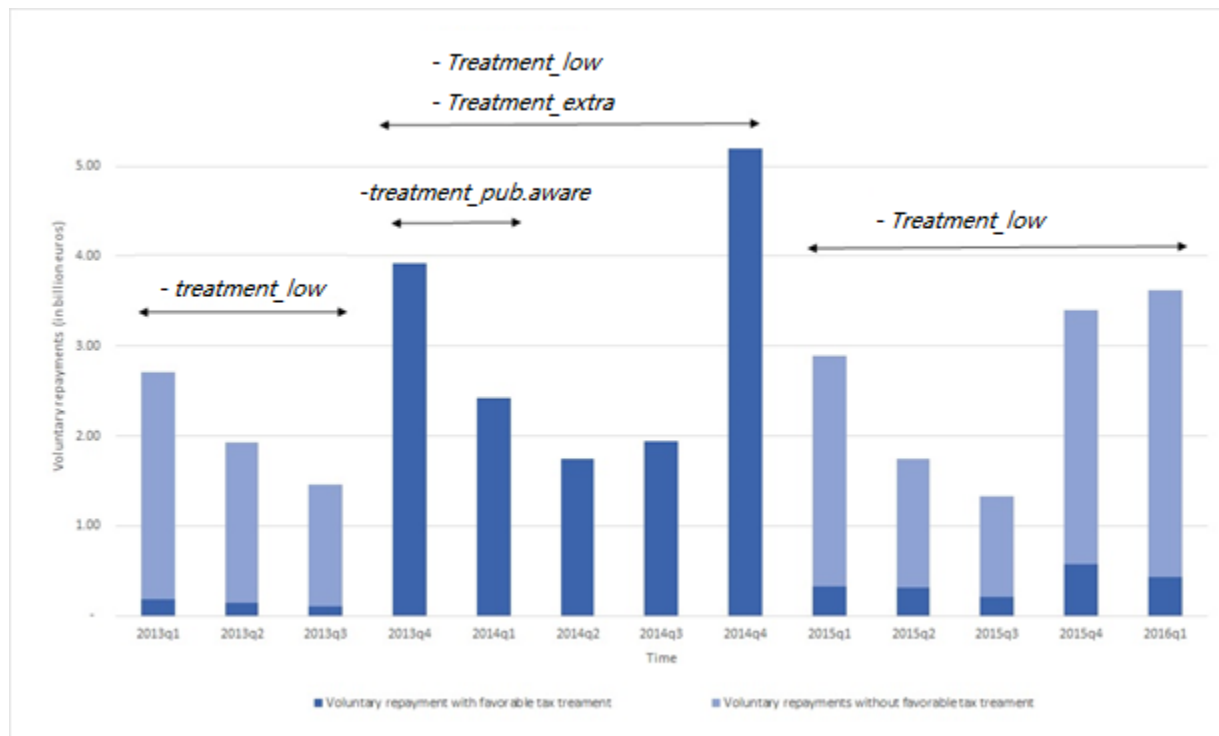


Figure 5, Define three treatment indicators

4.2 Main estimation results

Table 3 in the appendix displays the main results when we estimate Equation (1). First focus on column (1), where we restrict our sample conditioning on those who make mortgage voluntary repayments, and use the amount of voluntary repayment as the dependent variable, to examine whether $TreatmentLow_{it}$, $TreatmentExtra_{it}$ and $TreatmentPA_{it}$ increase voluntary repayment (intensive margin). After conditioning on all available information, we find that $TreatmentExtra_{it}$ and $TreatmentPA_{it}$ have positive and significant effects on voluntary repayments. As the conditional average of voluntary repayments is 23,849 (the average voluntary repayment using the conditional sample), the estimates of 5,325 and 666 imply that the extension of the tax exemption regime during the period 2013q4 to 2014q4 and increasing of public awareness during 2013q4 and 2014q1 increase the mortgage voluntary repayment by 22% and 4%, respectively. The coefficient of $TreatmentLow_{it}$ is negative, which is contradict to our expectation. The negative coefficient of $TreatmentLow_{it}$ is due to the cross-sectional difference that is only partly picked up by age, the $TreatmentExtra_{it}$ picks up the intertemporal effect, and it is the combination of these two that matters, but in this way, we disentangled it.

Other controls in column (1) have significant effects on mortgage voluntary repayments too. The coefficient of dummy for self-employment suggests that in comparison with wage-employed, self-employed are more likely to make more voluntary repayment. Self-employed have more expensive houses with larger debt (Li et al. 2014), which proportionally increases voluntary repayments. NHG is a discontinuous program in the sense that participation depends on house value.¹⁸ After controlling collateral values, the amount of voluntary repayment is more likely to be associated with houses covered by National Mortgage Guarantee (NHG). Age makes no difference to the voluntary repayments, and neither household income nor the indicator of missing household income is significant in determining the amount of voluntary repayments. We find that those loans with longer maturity and higher original LTV has significantly lower voluntary repayments. Contradict to our expectation, we find that the mortgage interest rate is associated with significantly lower voluntary repayments.

A number of robustness checks are carried out on the specifications of the model. Column (2) of Table 3 displays results for the probability to make voluntary repayment (extensive margin), where we use the binary indicator for making a voluntary repayment as the dependent variable. The results show that $TreatmentLow_{it}$, $TreatmentExtra_{it}$ and $TreatmentPA_{it}$ significantly increases the probability of making voluntary repayments. Moving on to Column (3), we now consider using the proportion of voluntary repayments in terms of current loan balance as the dependent variable. We find that only $TreatmentExtra_{it}$ has a positive and significant effect on voluntary repayments. The coefficient of $TreatmentLow_{it}$ is negative, but the same explanation also holds here as discussed for column (1).

4.3 Effect of policy extension across LTV categories

As mentioned in Section 2, the Dutch government extends the tax exemption regime during the period 2013q4 to 2014q4 to reduce excessive indebtedness. However, whether rich or poor households utilize this policy more often still calls for further checks. In this section, we examine whether the effect of $TreatmentExtra_{it}$ is the same across different LTV levels, as LTV level can be viewed as a proxy for the financial position of a household.

We group all observations by LTV into four categories¹⁹, and include the interactions between the four categories dummies and $TreatmentExtra_{it}$, respectively, into Equation (1):

¹⁸ NHG helps one to take out a mortgage that is affordable and responsible from the start. And if one runs into problems meeting your payments due to circumstances beyond your control, the NHG may provide a safety net for you and your mortgage lender.

¹⁹ LTV category: $[0, 0.6)$, $[0.6, 0.9)$, $[0.9, 100)$ and $[110, \infty)$.

$$y_{it} = \beta_0 + \alpha_1 * LTV_{60} * TreatmentExtra_{it} + \alpha_2 * LTV_{90} * TreatmentExtra_{it} + \alpha_3 * LTV_{100} * TreatmentExtra_{it} + \alpha_4 * LTV_{110} * TreatmentExtra_{it} + \beta_1 TreatmentLow_{it} + \beta_3 TreatmentPA_{it} + \beta_4 Z_t + \gamma X_{it} + \varepsilon_{it}, \quad (2)$$

The OLS estimation result of equation (2) is reported in Table 2. We find that the extension of the tax exemption regime during the period 2013q4 to 2014q4 increases mortgage voluntary repayment by 6,781 euro and 6,685 euro for borrowers with LTV of [0, 0.6) and [0.6,0.9), respectively. However, for borrowers with LTV of [0.9, 100) and [110, ∞), the extension only increases 4213 euro and 4594 euro, respectively. We conclude that the extension of the tax exemption regime stimulates rich households to make more voluntary repayment than poor households.

α_1	6781*** (5540)
α_2	6658*** (976)
α_3	4213*** (519)
α_4	4594*** (498)
Num. of obs.	

Table 2, Estimation results of interactions between LTV categories and $TreatmentExtra_{it}$.

5. Conclusions

In this paper, we identified the causal effect of the tax exemption regime on the intergenerational transfer: an extension of a tax exemption regime leads to more mortgage voluntary repayment, hence less household debt. In particular, to solve the issue of potential endogeneity of intergenerational transfer, we utilize the unanticipated tax exemption regime in 2013q4 to 2014q4 as a quasi-natural experiment and we investigate the causal relation between generous tax exemption regime and intergenerational transfer. We find that the extension of the tax exemption regime during the period 2013q4 to 2014q4 significantly increase the mortgage voluntary repayment by 22%. This empirical result is robust to a large range of sensitivity and specification changes. We further check whether the effects of the extension of the tax exemption regime is the same for different LTV categories, and find that it stimulates rich households (those have low LTV) to make more voluntary repayment than poor households (those have higher LTV).

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Appendix

	(2)	(1)	(3)
	Amount of vol. repay.	Indicator of vol. repay.	% of vol. repay. of total balance
<i>TreatmentLow</i> _{it}	-966.4* (546.4)	0.000833* (0.000429)	-0.00924*** (0.00296)
<i>TreatmentExtra</i> _{it}	5,325*** (409.1)	0.00509*** (0.000308)	0.0365*** (0.00222)
<i>TreatmentPA</i> _{it}	666.2* (364.6)	0.00340*** (0.000316)	-0.000623 (0.00198)
Macro interest rate (time effect)	-2,716*** (480.9)	0.00307*** (0.000379)	-0.0139*** (0.00261)
Age spline	Included	Included	Included
Household income (weighted)	0.000194 (0.000314)	-0 (0)	1.81e-10 (1.70e-09)
Dummy for missing household income	159.1 (683.6)	0.00210*** (0.000565)	0.00298 (0.00371)
Dummy for self-employed	5,390*** (534.7)	-0.000539 (0.000470)	0.0296*** (0.00290)
Dummy for other employment status	1,569 (1,339)	1.57e-05 (0.00115)	0.0196*** (0.00726)
Dummy for missing employment status	3,112*** (462.8)	0.00329*** (0.000377)	0.0219*** (0.00251)
Current balance	0.0406*** (0.00131)	-3.33e-09*** (1.21e-09)	-2.93e-07*** (7.10e-09)
Maturity (weighted)	-38.10** (15.15)	-4.66e-05*** (1.20e-05)	-0.000159* (8.21e-05)
Vitage (weighted)	-52.10 (49.69)	-0.00201*** (4.01e-05)	0.000579** (0.000269)
Dummy for NHG	-3,576***	-0.00962***	-0.0213***

	(342.5)	(0.000268)	(0.00186)
Mortgage interest rate (weighted)	-875.5***	-0.00212***	-0.00504***
	(272.8)	(0.000219)	(0.00148)
Mortgage interest rate (weighted) * Age [30,40]	-365.8	-0.000428	-0.00359**
	(314.7)	(0.000262)	(0.00171)
Mortgage interest rate (weighted) * Age (41,50]	-1,182***	-0.000172	-0.00366**
	(304.8)	(0.000249)	(0.00165)
Original LTV (weighted)	-77.92***	-0.000162***	-0.000855***
	(11.43)	(9.42e-06)	(6.20e-05)
Original LTV (weighted) * Age [30,40]	20.44	5.54e-05***	0.000184**
	(14.41)	(1.18e-05)	(7.81e-05)
Original LTV (weighted) * Age (41,50]	59.70***	7.76e-05***	0.000198***
	(13.26)	(1.10e-05)	(7.19e-05)
Proportion of IO loan	-294.1	0.00230***	0.000840
	(736.6)	(0.000592)	(0.00399)
Proportion of IO loan * Age [30,40]	1,769*	-0.00240***	-0.000479
	(1,002)	(0.000818)	(0.00543)
Proportion of IO loan * Age (41,50]	2,400***	-0.00452***	0.00273
	(920.5)	(0.000755)	(0.00499)
Regional dummies	Included	Included	Included
Banks dummies	Included	Included	Included
Cohort dummies	Included	Included	Included
Observations	34,155	1,653,547	34,155
R-squared	0.088	0.005	0.128

* Balance weighted by loan type

Table 3: Estimation results of voluntary repayment under different specifications