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How do the Dutch Finance their Own House?

Descriptive Evidence from Administrative Data

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Summary

We investigate the major financing components which are used to purchase a house in the Netherlands. This is important to shed more light on the effects of changing lending norms. We look at the full universe of housing transactions in the Netherlands by making use of administrative data from Statistics Netherlands (CBS) for the period 2006-2014. We first describe the financing patterns that actually occurred. In a second step we investigate the potential of Dutch households to reduce their mortgage lending. We do so by 'simulating' the financing patterns that could occur if homeowners use all of their financial assets to pay for their own house.

First time buyers ('starters') make more use of other forms of equity -such as savings and gifts- over time. Their capacity to decrease their mortgage debt and use other forms of financing also increases in the period from 2006- 2014. Second time buyers ('doorstromers') make use of the positive home equity of their previous house and also increase the use of other forms of equity over time. When we compare single and cohabiting households, we observe that single households seem to have lower mortgage debt on average and also more potential to reduce the mortgage debt at the time of purchase.

Our results have to be taken with a grain of salt: First, they can be driven by cheaper house prices and a tax reduction on gifts ('schenkingsvrijstelling'). Unfortunately our data does not allow us to pinpoint the exact source. If gifts are the driving force in lowering the actual mortgage, we overestimate the potential of households to lower their mortgage. Secondly, our data show substantial heterogeneity: further studies should focus on subgroups to validate to what extent our figures are representative for them.

1 Introduction

This background document serves as a supportive document for the CPB Financial Stability Report 2018 (CPB, 2018). In particular, we focus on the time trends regarding the financing of housing in the Dutch population.

The Netherlands experienced strong house price fluctuations in the recent decade. House prices declined by 20% between 2008 and 2013 and started to increase as of the third quarter of 2013. This recovery of the Dutch housing market in recent years has led to substantial price increases. Moreover, the Netherlands is one of the OECD countries with a high home-ownership rate and the highest gross mortgage to GDP ratio in the world. Recent research indicated that the institutional context such as mortgage interest rate deduction (MID) and the less strict lending norms compared to other countries (LTVs > 100 used to be allowed) facilitated lending and provided a strong incentive for home ownership compared to renting a house. However, over the past few years the Dutch government took measures in the housing market in order to mitigate the high prices and potential risks, such as LTI

norms, lower LTVs, reducing the mortgage interest rate deduction (MID) and making this conditional on the amortization of the debt.

The purchase of a house is the central consumption and investment decision for many households and individuals. It is the most important asset on the balance sheet of households. In recent years, low interest rates contributed to the price increase by facilitating the financing of high debt levels. The interest rates on mortgages with a 10 year fixed rate decreased with more than 50% in the last 10 years. Additionally, high expectations about further increases in house prices provided a strong incentive to purchase a house. Besides these institutional features and historical low financing costs, less is known about the individual choice factors behind mortgage debt (LTV at origination). Therefore, in this study we shed light on two important questions:

(1) How do households finance the purchase of a house?

We make a distinction between four important sources of finance: (1) mortgage, (2) (positive) home equity, (3) other debt and (4) other assets (such as liquid assets, gifts). We especially focus on the role of (liquid) assets to finance a home and the role of two subgroups: Can we observe differences between subgroups such as single households and cohabiting couples? To what extent can differences between first-time buyers and current owners be explained by positive home equity on the previous home? In a next step we address the following question.

(2) To what extent do households use equity, either positive home equity or financial equity to finance their homes?

We also address the question: How much (mortgage) debt would they have had if they had made use of their wealth such as savings, other assets and (positive) home equity first? We examine the financing potential of households when they use all of their financial assets to lower their mortgage. Thus, we investigate the extreme case scenario to what extent they can lower their LTV ratios.

We make use of administrative data of Statistics Netherlands (CBS) which combines transaction prices with the amount of the outstanding mortgage on a household balance sheet. We look at the universe of housing transactions in the period from 2006 to 2014. We focus on the composition of the financing of the purchase.

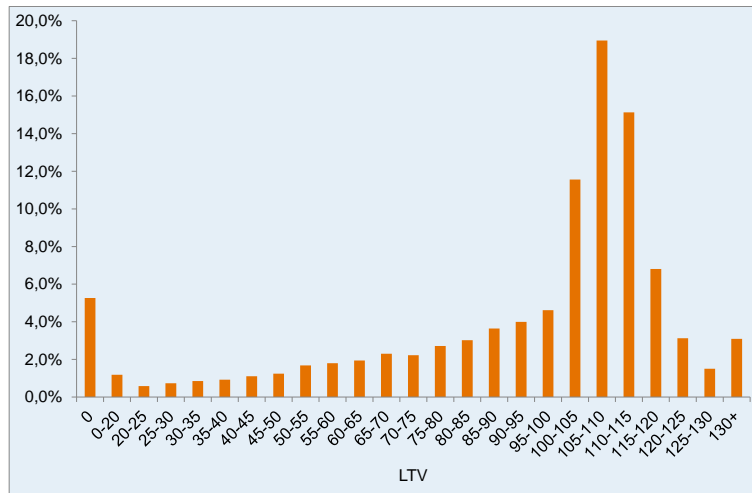
On the one hand, identifying patterns of mortgage lending is important for regulatory authorities such as the Dutch Central Bank (DNB) and the Dutch Authority for the Financial Markets (AFM) and the Ministry of Finance. This is because potential prudential policies (such as tightening lending norms) can be targeted at specific groups.

On the other hand, limits/caps on mortgage lending can be interpreted as reference points to which a majority of the population sticks. The reason is that these limitations serve as a default in the complex decision making process on how to finance the purchase of a house.

Individuals perceive default choices as implicit recommendations (Waterreus & van der Steeg, 2015, Marx & Turner, 2017). People who are uncertain about their preferences are more likely to stick to the default.

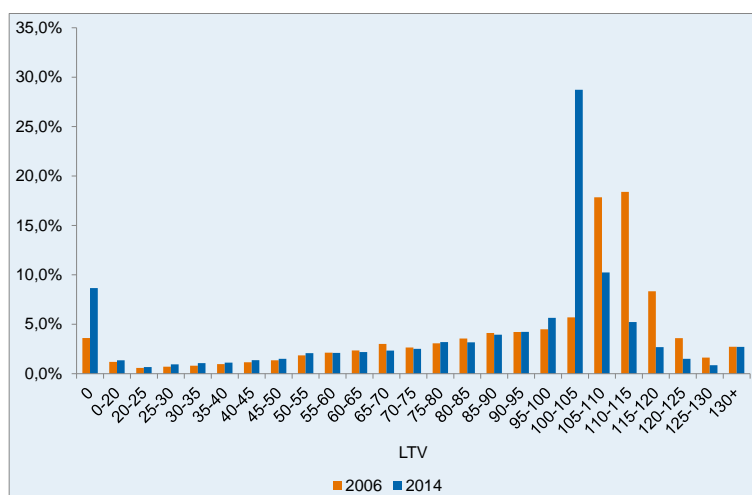
Overall, we observe substantial heterogeneity in the distribution of loan-to-value ratios (LTV) at the time of purchase. Figure 1.1 shows the distribution of LTVs in the period from 2006-2014 at the time of purchase. We calculate the LTV at the end of the year of purchase as the outstanding mortgage divided by the transaction price.

Figure 1.1 LTV distribution at origination in the period 2006-2014



The distribution is skewed to the left, with strong peaks of LTVs at 100-115. These peaks cover 45.6% of the distribution. 14.5% even have higher debt levels at origination. The remaining 39.9% are financed with mortgage debt levels below the purchasing price. One natural question arises from this picture: What are the underlying key determinants of this heterogeneity?

Figure 1.2 Time shift of LTV distribution at origination



A first answer to this question seems to be that there are time trends. After 2006, many housing market reforms took place: Among the most influential ones was the subsequent reduction of the maximal LTV from 106% before 2012 to 100% in 2018 in steps of 1 percentage points per year. Figure 1.2 shows the distribution of LTVs at the time of purchase in 2006 and 2014. There is a shift to lower LTVs especially between 105% and 130%. It is worth noting that even though stricter LTV rules were introduced, they failed to eliminate LTV ratios higher than 106% completely. This can be due to a quite flexible implementation of the policy that still exists. Nevertheless, the implementation of the policy is improving over the years. In 2006, more than 36% of new houses had a higher than 110% LTV ratio, whereas this percentage fell to 13% in 2014. Most interestingly, the fraction of people with an LTV of 0, more than doubled from 2006 to 2014. Note that the shift in the distribution can be due to many reasons. We will provide some explanations for in the interpretation of our results.

Our key findings can be split up by two groups; first time buyers ('starters') and second time buyers ('doorstromers'). First time buyers make more use of equity over time: the percentage of equity to finance the purchase of a house increased from 6% in 2006 to 16% in 2014. Moreover, the potential to pay a larger share of your own house with own funds has increased: in 2006, homeowners were able to finance up to 15% of the purchase with non-mortgage financing; this number increased to 24% in 2014. A similar but weaker pattern occurs for second time buyers, too. When we look at single and cohabiting households, we observe that single households seem to have lower mortgage debt on average and also more potential to reduce the mortgage debt compared to cohabiting households. The differences between single and cohabiting households can be partly attributed to the lower LTI levels for the first group.

The remaining part of this document is structured as follows. Section 2 describes the dataset which we constructed. Section 3 shows the main results, and section 4 provides the reader with some conclusions and ideas for further research.

2 Data

Our analysis is conducted with a unique administrative microdataset which is based on the whole universe of housing transactions in the Netherlands in the period from 2006 until 2014. We enrich this transaction data with balance sheet data on the household level. The data sources are the microdatasets provided by statistics Netherlands (CBS). The main data of our analysis consists of 439,368 transactions.

The dataset for our analysis was constructed by merging five different administrative data sources based on the full population of the Netherlands. We start off with the dataset 'bestaande koopwoningen' which consists of all housing transactions of existing buildings in the Netherlands. We then merge this dataset with the address registry ('gbaadresobjectbus') and registry information on the household composition ('gbahuishoudenbus'). In a fourth

step we merge this data with balance sheet information on the household level ('integraal persoonlijk inkomen' and 'integraal-vermogensbestand'). These two datasets contain all information on financial assets and liabilities which have to be filled in on the tax declaration forms.

3 Results

We present descriptive statistics on the composition of the financing of the purchase of a house. We do this for two reasons. First, we aim at explaining the heterogeneity in LTVs at the time of purchase. Second, we aim to explain the financing of the total costs when purchasing a house. Therefore, we also include transaction costs of the purchase. This is relevant since the purchase of a house involves stamp duty, notary costs, bank fees, in most cases agency fees and moving costs. We calculate total transaction costs of 4% and add the costs of the stamp duty (the Dutch transaction tax). We also take into account the decrease in stamp duty from 6% to 2% of the transaction price in 2012. Hence we take transaction costs of 10% into account before 2012 and 6% after 2012.

Our analysis proceeds in four steps. We begin by comparing LTV distributions between first and second time buyers over the whole time span of 2006 - 2014. We continue by showing the composition of the different types of financial means households used to finance the purchase of their home. Next we show the potential composition of financial means if a household had used all their remaining liquid financial assets to reduce their mortgage (including any positive equity of the previous home that is not already used to finance the purchase). In a last step, we look at how the financial composition and the potential financial position evolved over time.

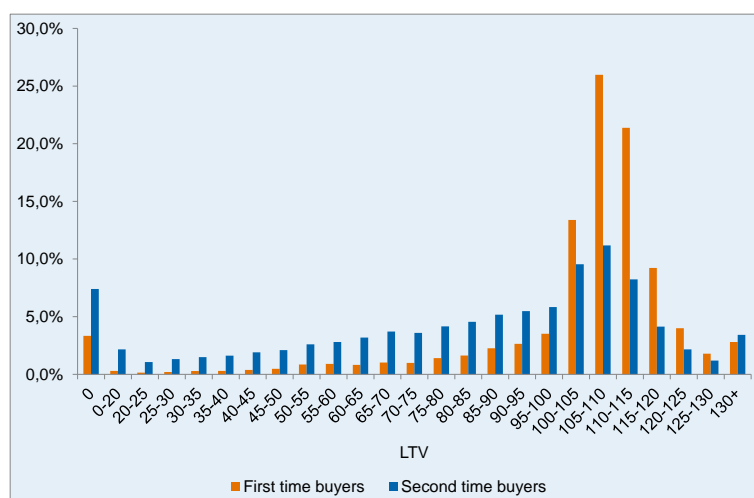
3.1 First and second time buyers

One important distinction which has to be made is to separate first time ('starters') and second time buyers ('doorstromers'). As second time buyers we consider individuals who buy their second, third or nth house.

Figure 3.1 shows the distribution of LTV at origination for first and second time buyers for 2006 until 2014. Three main messages emerge from this figure. Both distributions show substantial heterogeneity. Both distributions are skewed to the left and show peaks at the higher LTVs from 100-115. However, the distribution for second time buyers is less skewed than the one for first time buyers. 70% of the first time buyers have an LTV between 100 and 120%. For second time buyers this is only 33%. This means that second time buyers, on average, have substantially lower LTVs.

3.1.1 Distribution of LTVs

Figure 3.1 LTV-distribution at time of purchase of first and second time buyers for the period 2006-2014



3.1.2 How did households finance their home purchase?

In this section, we take a look at the financing of the average housing purchase in our sample; we start with the whole sample period from 2006 – 2014 and split the sample into first and second time buyers. We determine the composition of house financing in five steps, each step adding an additional layer of financing:

1. We calculate the total costs of a housing purchase by adding 10% transactions costs to the purchasing price before 2012 and 6% transaction costs after 2012.
2. We look at the outstanding mortgage on a household's balance sheet at the end of the year of purchase and take that as the first ingredient to fill the bucket. If this covers the purchase costs for a household, we stop here and assume that the house is fully financed by a mortgage. If the outstanding mortgage amount is smaller than the purchasing price, we continue with the next step.
3. In a next step, we look at the equity of the previous home. We take the sales price of the previous residence (for second time buyers only) and subtract 1% sales costs. Then we subtract the value of the mortgage at the start of the year of purchase. Any positive equity of the previous home is used to continue to fill the bucket. If the sum of the mortgage (from the previous step) and the equity of the previous home is less than the total purchasing costs, we continue with the next step.
4. Now we consider the value of the non-mortgage-related debt by comparing the value on the balance sheet between the start and end of the year of purchase. We assume that any increases in this debt have been used to finance the house, provided that the house is not already fully financed by a mortgage and positive equity of the previous home. Again, if the sum of the used 'ingredients' does not cover the purchase price, we continue with the next step.
5. In a last step we look at how much of the purchasing costs are not yet accounted for. As we are unable to determine money source, we call this component "other sources". This

includes financial assets, gifts or other unexpected positive income shocks such as high bonus payments or lottery wins.

In the following table, an example illustrates our approach. Consider a household in 2012 with the following relevant balance sheet items:

Table 3.1 Snapshot of household balance sheet before and after

January 1 st 2012		January 1 st 2013	
Assets	Liabilities	Assets	Liabilities
Financial assets	20,000	Mortgage	120,000
House (old)	170,000	Other debt	10,000
		Financial assets	20,000
		Mortgage	150,000
		House (new)	200,000
		Other debt	15,000

In the following table 3.2, we show how we calculate the required financing, as well as the actual use of the ingredients.

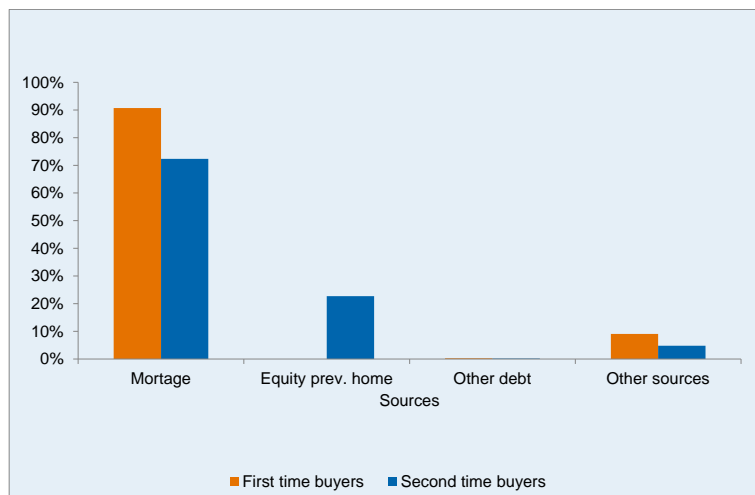
Table 3.2 Financing example of purchase of a new home

Source	How?	Calculation	Value
Financing required	House value + transactions costs (10% in 2012)	$200,000 * 1,1$	220,000
Mortgage	Balance sheet January 1 st 2013		150,000
Excess value (equity) previous house	House (old) – Mortgage January 1 st 2012 – transactions costs (1% transaction costs)	$170,000 * 0,99 - 120,000$	48,300
Other debt	Balance sheet January 1 st 2013 - Balance sheet January 1 st 2012	$15,000 - 10,000$	5,000
'Other sources'		$220,000 - 150,000 - 48,300 - 5,000$	16,700

Note. We only observe private family loans in the data if they are declared in the tax form.

The results of the abovementioned process are shown in figure 3.2. The figure shows the (average) fraction of sources which are used to finance the purchase of a house for two groups: first time and second time buyers. The most important source to finance the purchase is the mortgage. First time buyers finance 91% of the purchase with a mortgage and second time buyers 72%. Second time buyers also make use of the equity of their previous home to finance about 20% of the purchase. Interestingly, in our period of investigation, other debt does not seem to play a role for financing the purchase of house. Also other sources, which include gifts, unobserved amortization, and financial assets, only play a minor role.

Figure 3.2 Financing of purchase between 2006 to 2014 for first and second time buyers



3.1.3 What is the financing potential of a home purchase?

In the previous figure we showed how much of each financing source households on average actually used. In this part we ‘simulate’ the financing of the purchase assuming that households use all their savings and other financial assets first before they make use of a mortgage to finance the purchase.

The key idea of this exercise is to identify a lower bound of mortgage financing, given all other debt and financial assets remain constant. In this way, we shed light on the potential impact of stricter lending norms and the financial buffer households have. Note that it is also an extreme scenario since we assume that a household makes use of all liquid assets to finance the purchase. In the realized financing, we observe that ‘other resources’, which includes financial assets, has become more important in recent years.

It is not straightforward how a reduction in mortgages will affect the risk of defaults. A reduction in mortgages, and the corresponding LTV’s, might lead to lower risk of defaults through lower monthly mortgage payments. Moreover, defaults have a lower impact as the collateral is more likely to cover the mortgage if LTV’s are lower. However, lower LTV’s do not necessarily reduce risk if households primarily financed the reduction in the mortgage by depleting their financial buffer. Three factors increase ‘other resources’: (i) gifts of family members increased (which could be related to tax incentives such as the ‘schenkingsvrijstelling’), (ii) households saved more, prior to the purchase of the house and (iii) households used relatively more of their financial assets to finance the purchase. In the latter case the financial positions of the households did not improve since they merely deplete their financial buffers. It is therefore important to identify to what extent households use their financial buffers in order to reduce their mortgage.

To illustrate the way that financing potential is calculated, we again use the example of Table 3.1. The key idea of this exercise is to minimize the amount of the outstanding mortgage by making use of equity in the form of other financial assets or other sources. This time we first look at the households’ financial assets on their balance sheet. We assume they use all their

liquid financial assets, in the example 20,000 euros, consequently reducing their potential mortgage. The amounts of other debt and sources remain unchanged (Table 3.3).

Table 3.3 Financing example of financing potential for the purchase of a new home

How?	Calculation	Value
Mortgage 1 st 2013 – Surplus financial assets	150,000-20,000	130,000

The results of the aforementioned process are presented in figure 3.3. We compare the results in figure 3.3 with the realized financing results in figure 3.2 (which for ease of comparison is repeated in figure 3.3). Our scenario shows that there is some potential to reduce mortgage related debt when purchasing a house. The mortgage debt which is used to finance the purchase of first time buyers decreases from 91% to 83% (top part of figure 3.3). Second time buyers' mortgage debt could decrease from 72% to 61 % (bottom of figure 3.3).

Figure 3.3 Realized financing vs. potential of first and second time buyers for the period 2006-2014



3.2 Developments over time

3.2.1 Realized Financing

In this section, we look at the development of the use of financial means for the purchase of a house in the period from 2006 until 2014. Again, we split our sample in first time buyers and second time buyers.

'Other sources' became a more important resource to finance the purchase of a home for first time buyers in recent years. In 2014, 16% of the purchase was financed via this source. Figure 3.4 shows the finance composition for first time buyers calculated in the same way as in figure 3.2 for each year separately. Possible explanations for this time trend can be the reduction in the maximum LTV or the tax incentives for gift ('schenkingsvrijstelling').

Figure 3.4 Development of financing of purchase over time for first time buyers

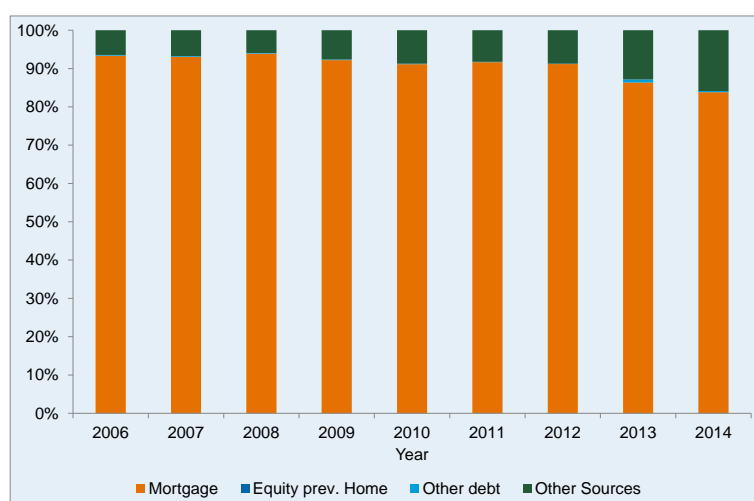
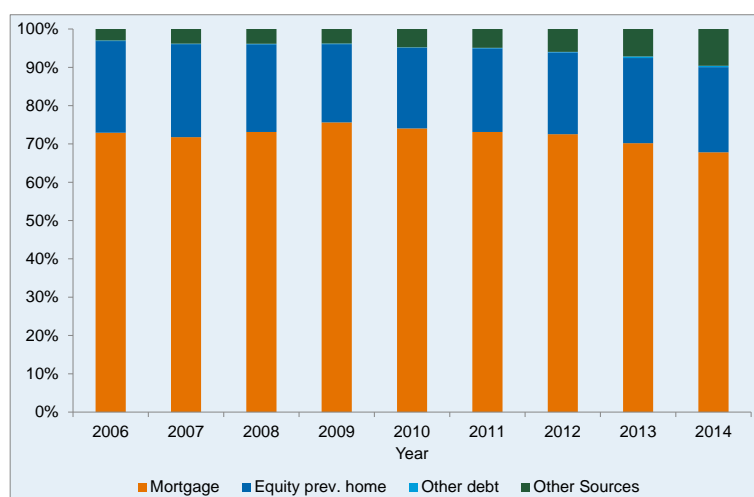


Figure 3.5 Development of financing of purchase over time for second time buyers



The time trend in financing patterns is similar for second time buyers compared to first time buyers. The development is shown in Figure 3.5. As of 2010 other financial sources became more important to finance the purchase of house. In 2014 about 10% of the purchase was financed with other financial sources, such as gifts. This is a substantial increase compared to 2006. The equity which is extracted from the previous house remains the second most important resource to finance the house besides the mortgage. The percentage of positive home equity is relatively stable over time. This might be due to a selection effect as households with relatively low equity of their previous home during the housing market bust move less (Van Veldhuizen et al. 2016, Steegmans and Hassink 2017).

3.2.2 Financing potential

How did the financing potential of a purchase evolve over time? Can households in theory use other sources than a mortgage to finance their house? Figure 3.6 shows the pattern for first time buyers and Figure 3.7 shows the picture for second time buyers.

The key insight from these figures is that in 2006 first time buyer households could have used 15% equity to finance the purchase of their home. This amount increased to 24% in 2014 and it mainly consists of savings and gifts. The picture is different for second time buyers. In 2006, second time buyers had the potential to finance about 39% of the purchase with other financial sources than a mortgage. This percentage only slightly increased to 43%.

Again, it is important to mention that this is an extreme scenario. In our simulation the household would be left with essentially zero liquid assets after the purchase. However, both first and second time buyers do not seem to deplete their financials buffers to reduce their mortgage debt. This can be observed by the fact that the share of financial assets remains relatively stable over time. The increases in 'other resources' seen in figures 3.6 and 3.7 is most likely the result of higher gifts.

Figure 3.6 Development of financing potential of first time buyers

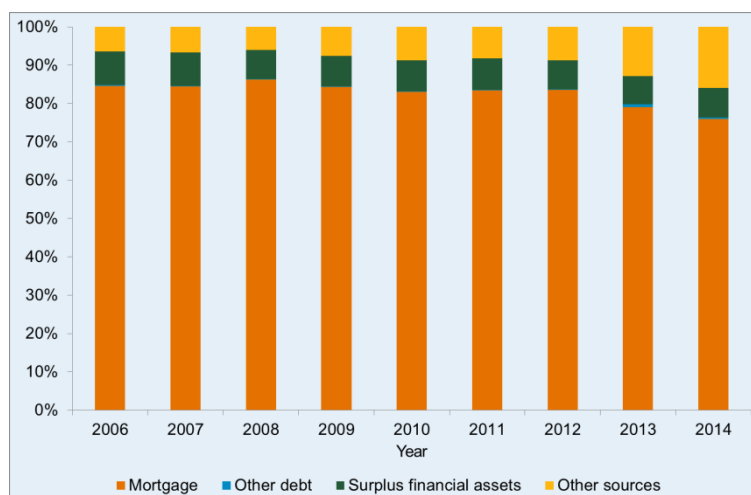
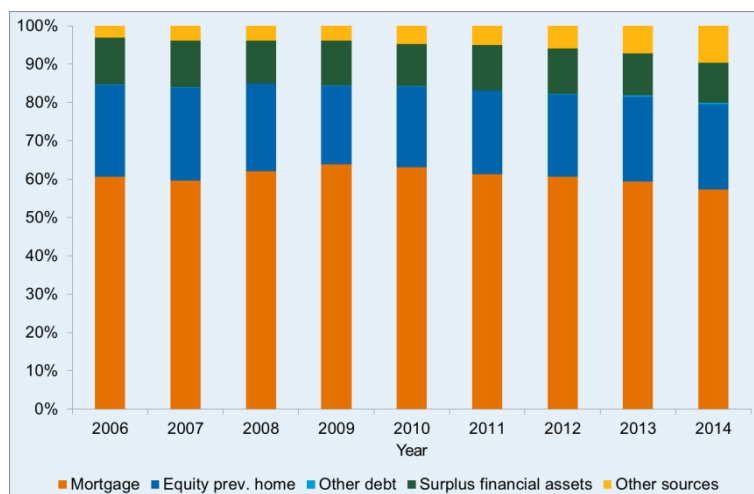


Figure 3.7 Development of financing potential of second time buyers



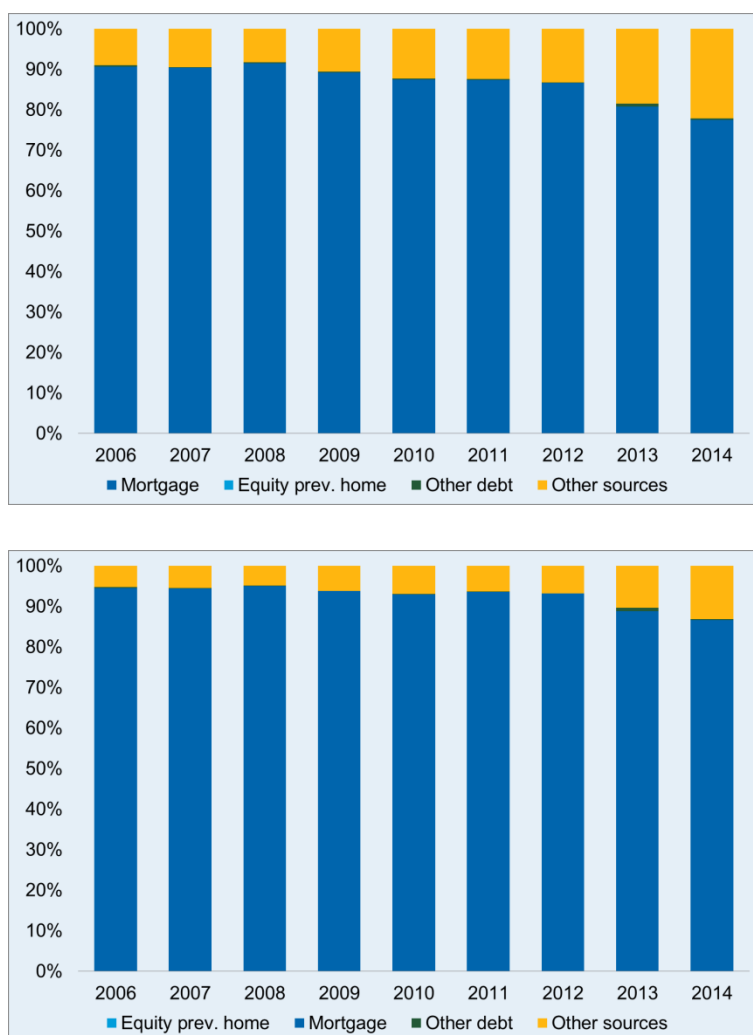
3.3 Single vs. Cohabiting Households

In this section we extend our analysis to two important subgroups. We compare the composition of financing the purchase of a house between single and cohabiting households.

3.3.1 Realized Financing of first time buyers

Two observations arise from our data (figure 3.8). Single households make more use of other sources to finance the purchase of the house than cohabiting households. The share of other financing sources increases over time. Single households finance about 9% of the purchase with other sources in 2006 and increase this share to 22% in 2014. Cohabiting households increase the share of other sources from 5% in 2006 to 13% in 2014.

Figure 3.8 Realized financing of first time buyers: Single (top) vs. cohabiting (bottom) households

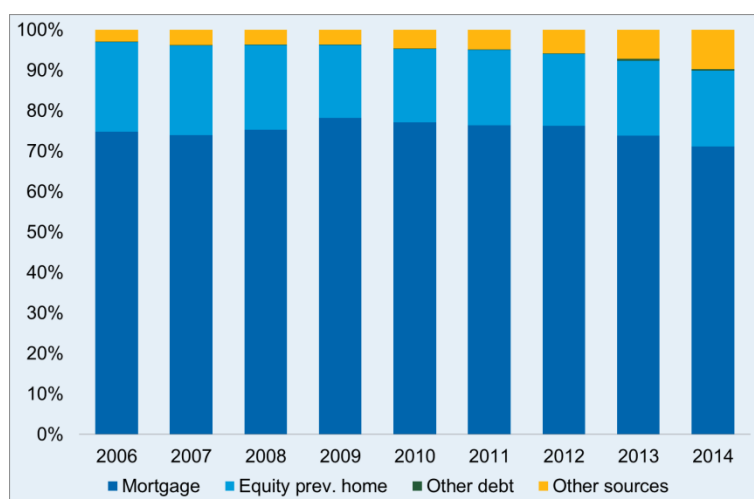
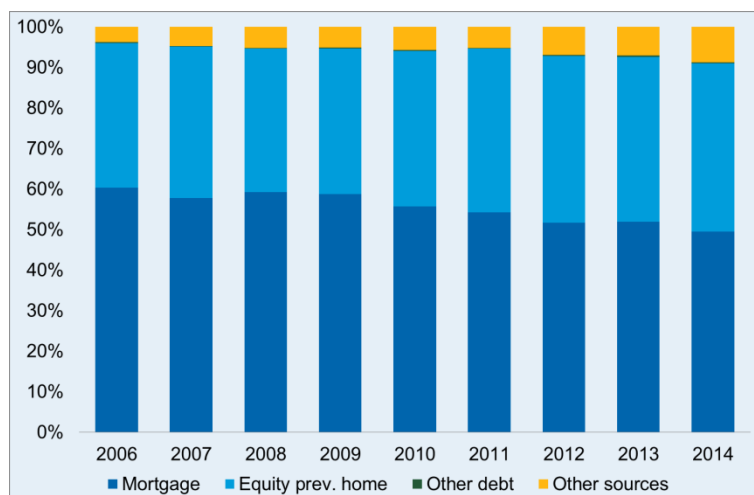


3.3.2 Realized Financing of second time buyers

A similar picture emerges from the data on second time buyers (figure 3.9). Single households make substantially more use of the equity of the previous home and other sources to finance the purchase of the house than cohabiting households. Single households increased the amount which was financed with equity of the previous home from 36% in 2006 to 41% in 2014. For cohabiting households the amount decreased from 22% to 18% in 2014.

The share of other financial sources is small for both groups but also increases in the period from 2006 to 2014 from about 4% to 9% for single households. For cohabiting households the increase is stronger, namely from 2% to 10%.

Figure 3.9 Realized financing of second time buyers: Single (top) vs. cohabiting (bottom) households



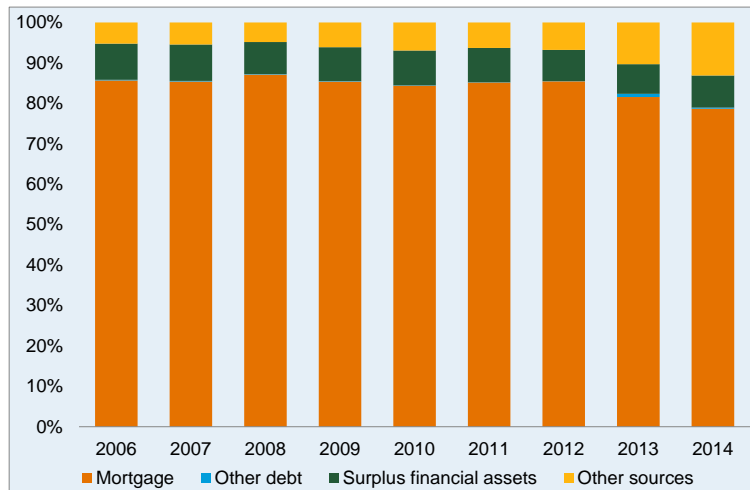
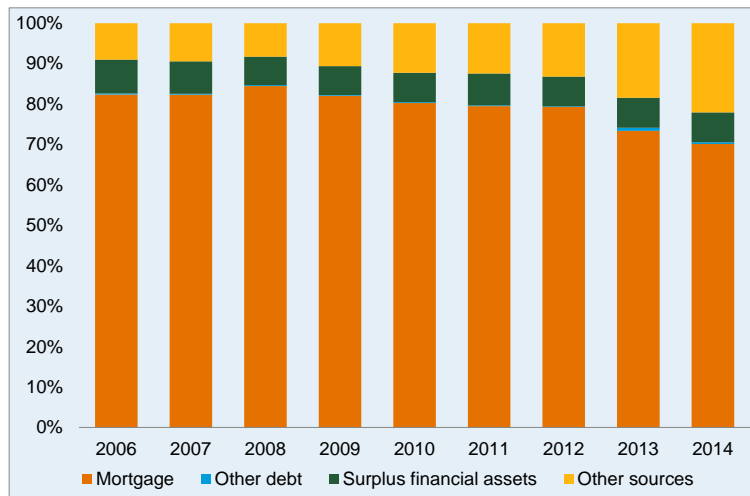
3.3.3 Financing Potential of First Time Buyers

Next, we look at the financing potential of the two subgroups in the first time buyers group. The idea here is to look at the minimum amount of mortgage financing. Hence, these figures always have to be compared with their counterparts in figure 3.8.

Figure 3.10 shows the financing potential of first time buyers single (top) and cohabiting (bottom) households from 2006 until 2014. The picture that emerges from our data is that both groups do have the potential to reduce the mortgage debt. However, single households have more scope than cohabiting households. In our scenarios single households could potentially finance about 82% of the purchase with a mortgage in 2006 and about 70% in 2014. A similar trend is also prevalent for cohabiting households: the share of the minimal mortgage needed decreases from 86% in 2006 to 79% in 2014. This means that single households have the potential to finance 30% of the purchase with sources other than a

mortgage in 2014. Cohabiting households have the potential to finance 21% of the purchase with equity or other sources.

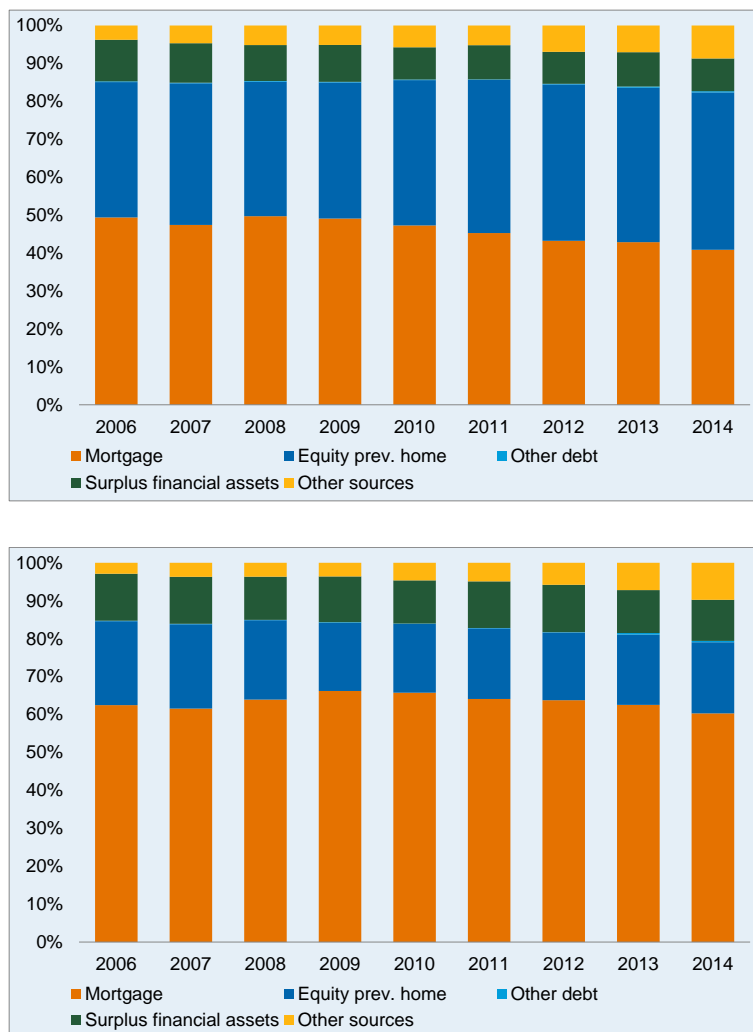
Figure 3.10 Financing potential of first time buyers: Single (top) vs. cohabiting (bottom) households



3.3.4 Financing Potential of Second Time Buyers

In the group of second time buyers we observe again differences between single and cohabiting households (see figure 3.11). The minimum percentage of mortgage financing for singles decreases over time; however this occurs mainly due to an increase in financing through their equity of the previous home and other sources rather than an increase in their surplus financial assets. On the other hand, cohabiting households face the same minimum percentages of mortgage financing in 2014 as in 2006. Their financial assets remain relatively unchanged over time.

Figure 3.11 Financing potential of second time buyers: Single (top) vs. cohabiting (bottom) households



4 Concluding Remarks

In this document, we present time trends in the average financing of house purchases for Dutch households.

How do households finance their house?

A mortgage is the most important source of finance for the majority of Dutch home owners. However, there have been developments in recent years towards an increase in the share of equity. For first-time buyers we see the largest increase: the average percentage of equity for a house purchase increases from 6% to 16% in 2014 (figure 3.4). For second-time buyers the percentage of equity increases from 27% in 2006 to 32% in 2014 (figure 3.5). It is important to mention here that the role of positive home equity of the previous home remains constant over time while the major increase in equity stems from the use of other financial sources.

The share of other sources increases in all subgroups: single households, couples, first and second time buyers. When looking at the subgroup of second time buyers, singles finance a larger part of their new house by positive home equity than couples. One possible explanation for this is that couples decide to move to larger and more expensive house when buying their next house while singles choose houses with a smaller value difference to their first house. It is worth mentioning that the decisions of singles partly derive from income limitations.

Our dataset does not allow us to pinpoint the exact composition of the equity contribution. However, a back of the envelope calculation can illustrate the numbers: The average purchasing price of a first time buyer in 2014 was about 185,000 Euros. Financing 16% of these purchasing costs with other sources than a mortgage, means that on average a household has to have about 28,000 euros in some form of liquid assets such as savings.

To what extent are household able to use more equity for the purchase of the home?

Especially second time buyers are able to reduce their outstanding mortgage (figure 3.3), by making use of their surplus of financial assets. Over time we observe only little changes in their financing potential (figure 3.7). The change in financing potential is more pronounced for singles than for couples (figure 3.10 and 3.11). For first time buyers this is due to the relative increase in funding from other sources. For second time buyers this is due to the increasing importance of positive home equity.

What could be potential drivers of the patterns? The decrease of LTV ratio over time for levels above 100% can be explained by the introduction of LTV caps. The Dutch government introduced regulations to decrease the level of maximal LTV starting in 2012. Another driver of the lower LTV ratios are the lower house prices during the crisis. When buyers use their financial assets for a cheaper house, the level of mortgage needed is lower thus leading to a lower LTV ratio. At the same time, policy interventions provided incentives for wealth transfers from the older to the younger generation through bequests and gifts. These amounts are used for house purchases and are most likely to play a larger role for first time buyers.

Next to 'pure' bequest motives the low interest rate environment can potentially contribute to intergenerational transfers since housing investments seem to be more profitable. If gifts played a big role, we actually overestimate the financing potential. Whether this is actually the case is a question for further research. Last, mortgage interest rate deduction (MID) is less advantageous when used in times of low interest rates. Thus, it might be more profitable to make use of the money to reduce mortgage debt (Groot & Lejour, 2017).

What important questions evolve? What are the shortcomings of this study? We wanted to set the basis for additional research on household's choices on how they finance the purchase of their home. Our current research is mainly descriptive but it is the first step for the systematic evidence of mortgage debt determinants and the explanation for the heterogeneity in the debt levels.

Increasing equity when purchasing a house comes with strong trade-offs that we do not consider in this document. Households might cut their consumption and postpone their decision to buy a house (CPB, 2015). This, in turn, can decrease demand for owner-occupied buildings and increase demand for rental buildings.

There are a couple of important questions which evolve from our results: To what extent are the results driven by heterogeneity in the subgroups (e.g. high vs. low income)? Is there regional variation in the ability to reduce the mortgage debt? What kind of incentives can be used so that second-time buyers use more home equity and reduce their share of the mortgage? When answering this question we should not ignore the fact that single second-time buyers reduce the share of the mortgage over time while couples' mortgage shares remain relatively unchanged.

Another important issue that arises is the choice of house characteristics. These characteristics – e.g. the size of the house – could explain part of the differences we observe between groups or over time (such as the higher loan to value ratio of couples second-time buyers than single second-time buyers or the lower LTV levels in 2014 when compared to 2006). These characteristics could be investigated in a future research that would further shed light in the Dutch household market.

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Appendix

Construction of the dataset and cleaning procedure.

To perform our analysis, we need clean and reliable data on mortgage debt. We delete observations with missing information on various aspects such as the composition of the household. In our analysis we use observations on households that consists of one or two adults (with or without children), who sold their house *and* moved to a new one during the following calendar year. This selection is made in order to avoid “double” mortgages on a households’ balance sheet and hence overestimate the actual LTV. The merging and cleaning process is described in detail in table 1 below.

Table A.1 Construction of the dataset

Start with Transactions of Houses	Observations	Deleted
Starting point	1,556,453	0
No address	1,556,197	256
Multiple transactions for the same address	1,525,965	30,232
Merge with Address Dataset		
No relocation during the calendar year after the transaction year	1,380,989	144,976
New transaction during the moving out year	1,374,364	6,625
Either nobody or the previous occupant lived in the property at the end of the relocation year	1,319,216	55,148
Merge with Household Dataset		
No data regarding household composition	1,319,182	34
Inconsistent type of household	1,301,480	17,702
Remove institutional and other type of households	1,295,081	6,399
Inconsistent number of people in the household	1,294,724	357
Inconsistent number of children in the household	1,294,721	3
No or multiple heads of household	1,280,686	14,035
Households with other type of household members	1,271,541	9,145
Transactions where according to the data there are other household members, but these household members are not present in the data file	1,271,520	21
Transactions where the number of observations is not in accordance with the type of household	1,271,427	93
Transactions for which the number of partners is not in accordance with the type of household	1,271,425	2
Transactions where one of the buyers is involved in another transaction during the relocation year	1,270,562	863
Transactions for which moving out occurs in 2015	1,250,245	20,317
Merge with Income and Assets Datasets		
Key-variable is missing for base year, year of moving out or the year in between (address, core person, type of household, assets).	1,217,832	32,413
Households have no core person during the time of moving out	1,190,872	26,960
Households have a core person outside of the household	1,190,010	862
Value of property is equal to zero at the time of moving out	1,131,813	58,197
Transactions from the year 2005	982,378	149,435
Selections		
Only households with constant composition of adult members from base year until the year they moved to a new house	601,984	380,394
The value of the property is 0	599,063	2,921
Only households which buy a house and move in in the same year	524,481	74,582
Only second time buyers who sell their old house and buy a new one on the same year	439,368	85,113

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