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Is additional indebtedness the way to increase mortgage-default insurance coverage?

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DESIGN PAPER 115

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Abstract

The Dutch Parliament unanimously adopted a motion to ask the Minister of the Interior to increase the maximum loan-to-value (LTV) ratio for home buyers who apply for mortgage-default insurance (NHG). The reason for this motion is that the share of mortgages with such insurance is rapidly declining among first-time home buyers.

In this paper, we first examine whether the reduction in the NHG market share is due to the lower LTV caps. Next, we analyze whether relaxing the LTV cap for NHG, in effect raising it to over 100%, can constitute an incentive to moral hazard, where (married) couples choose to divorce rather than carry residual debt.

Our analysis shows that two factors are responsible for the drop in market share. First, the price increase in the housing market in combination with the reduction of the price threshold for NHG qualification has led to reduced eligibility for mortgage-default insurance. Second, the interest rate reduction for NHG loans, which was an important incentive to acquire NHG insurance, has nearly disappeared.

Our study also shows that the chance to strategically seek divorce has increased the hazard rate into divorce by 31%. Connected to this, we show a number of negative externalities that could arise when divorces increase, including worsening of the pension position.

Samenvatting

Het aantal hypotheken met Nationale Hypotheek Garantie (NHG) onder starters daalt. Bij een nieuwe huizencrisis zijn daardoor minder mensen verzekerd tegen een onderwater-hypotheek. Een mogelijke oplossing is verhoging van de loan to value (LTV) ratio zodat de NHG verzekering bij het afsluiten van een hypotheek bij aankoop van een huis kan worden meegefinancierd. Additionele hypotheekschuld kan mensen in tijden van crisis echter nog verder in de problemen brengen. Dreigende restschulden lijken bovendien te leiden tot 'strategische scheidingen' om van de NHG gebruik te kunnen maken. Dat blijkt uit een Netspar-rapport door onderzoekers aan de VU Amsterdam.

Uit de analyse blijkt dat vooral de hogere huizenprijzen, de lagere wettelijke drempels en de verlaging van rentevoordelen debet zijn aan de afname van het aantal NHG-hypotheken. Het mogelijk maken om NHG mee te financieren leidt er dus niet vanzelfsprekend toe dat meer mensen de verzekering afsluiten. Bovendien lijkt het huidige systeem onbedoelde prikkels te geven voor strategische echtscheiding: herenigingen in crisistijd van gescheiden 'NHG-koppels' blijken drie jaar na dato ongeveer twee keer zo veel voor te komen als in normale tijden.

Om te voorkomen dat in een volgende huizencrisis veel mensen met een restschuld blijven zitten en om de mogelijke onbedoelde prikkels van de NHG te verminderen, zouden beleidsmakers een aantal maatregelen kunnen nemen

1. Het recht op uitkering van de NHG verzekering is nu gebaseerd op een keuzevariabele (zoals echtscheiding). Dat kan een onbedoelde prikkel geven wanneer mensen met een restschuld dreigen te blijven zitten. Bovendien kunnen beleidsmakers de mogelijkheid verkennen de verzekering standaard te laten gelden voor iedereen die een NHG hypotheek afsluit. Risico hierbij is dat de huidige buffer niet volstaat in een echt grote huizencrisis.
2. Herzie de premiesystematiek van betaling voor de verzekering in één keer naar periodieke betalingen zodat geen extra schulden nodig zijn om de premie te financieren.

Het verhogen of afschaffen van de hypotheekgrens voor NHG of zelfs het verplichtstellen van aankoop NHG bij het afsluiten van een hypotheek zorgt ervoor dat mensen in duurdere gebieden (zoals grote steden) ook een garantie kunnen of zullen afsluiten.

1. Introduction

The rapid deflation of the Dutch housing price bubble in the aftermath of the protracted 2008 financial crisis prompted tax and regulatory measures to restrain aggregate debt. By contrast, the present accelerated re-inflation of housing prices calls for new policy, since would-be home buyers with little or no savings are effectively cut off from access to owner-occupied housing in main urban areas.

Many countries have institutions that provide home-loan guarantees or mortgage-default insurance (BIS, 2013). In the Netherlands, this is the Nationale Hypotheek Garantie (NHR). The NHG is very popular among first-time home buyers, but as the guarantees are in essence backed by taxpayers, it has an important public policy function. Policymakers are happy with the extensive insurance provision for several reasons, of which we list two. From a macroprudential perspective, it provides a buffer that helps stabilize the financial sector in case of macro shocks that trigger a large increase in mortgage defaults due to household earnings losses. This is particularly important when a household sector that is highly debt-leveraged leaves creditors exposed and vulnerable. For instance, loan-to-value (LTV) ratios at mortgage inception often exceeded 120% in the Netherlands[1]. From a microeconomic perspective, the NHG insurance allows lower interest rates and protection, especially to young borrowers during the early years of their working career and family formation.

One of the main regulatory parameters of macroprudential policy is the LTV ratio limit that applies to new home loans. This limit was introduced in the wake of the 2008-2012 housing price crisis, when many mortgages went underwater (home equity turned negative). In a move to bring (the riskiness of) household debt further down, the LTV cap was subsequently lowered by 1% annually, from 106% to 100% between 2013 and 2018.

Recently, however, NHG participation has dropped precipitously in parts of the Netherlands. In response, a parliamentary motion was introduced to lift the LTV cap again, with the explicit goal of easing the transition to first-time home ownership with NHG coverage. We argue in this paper that this policy change is ill-conceived and, in particular, that there is no direct link between the NHG choice of borrowers and the LTV parameter.

1 The debt holdings of Dutch households are among the highest in the world relative to income. The main aggregate component is mortgage debt. One of the main drivers of this phenomenon is the full deductibility of first-home mortgage interest payments from the income tax base, in combination with the widespread use of interest-only mortgage loans that do not require repayment of principal (Mastrogiacomo, 2016).

BOX 1: NHG scheme

Mortgage-default insurance (NHG – Nationale Hypotheek Garantie) creates a guarantee at inception of a mortgage loan. Borrowers pay a one-off commission (1% since January 1, 2014, 0.85% in 2013, 0.70% in 2012) for this insurance. Banks give borrowers with NHG insurance a discount on mortgage interest of typically between 0.3 and 0.6 percentage points. This discount can be higher when the borrower has a higher LTV. When the borrower sells the property and retains residual debt, the NHG fund will step in and repay the bank if conditions are met. The borrower continues to be liable but now has the NHG foundation as creditor. Due to the high leverage ratios and low housing prices during the credit crisis, residual debts became common. If the reason for default is divorce, disability, unemployment, or death, and if the borrower has taken action to minimize the losses, the fund may unilaterally cancel the debt. As from 2014, an affordability test is carried out. Our study focuses, however, on the years before that.

It is normally advantageous for the borrower to pay the commission and to buy the guarantee. Because the NHG fund guarantees the loan, the lender has certainty that the loan will be paid off. Due to the public guarantee, the risk for the bank is negligible. Ultimately, taxpayers collectively guarantee the NHG mortgages so that the risk lies with them.

The NHG guarantee can be bought on properties up to a ceiling amount. This ceiling has fluctuated somewhat recently. It was €240,000 in 2005 and was lifted step by step to €265,000 in 2008. It was then abruptly lifted to €350,000 in 2009 and then lowered back in steps to €245,000 in 2015. At present, the ceiling follows the development of average housing prices and stands at €265,000. Neither the ceiling nor the premiums depend on the household composition or on the riskiness of the loan. The premiums paid are, however, deductible as mortgage interest deduction. Once a bank agrees to a loan, the NHG will guarantee it if its original value is below the ceiling amount.

The guarantee also covers additional loans that are used either for quality improvements (such as remodeling) or for the purchase of the land or ground lease (typically for a period longer than ten years).

The number of households that made use of the NHG guarantee due to forced sale at a loss increased considerably during the crisis, mostly in 2010 and 2011. Approximately 80% of annual guarantee requests are honored. In 2011 for instance, more than 1,700 households applied for reimbursement, which is more than twice the number of requests in 2007. The increase is the direct result of two effects: household income loss, which led to higher default rates during the crisis, and the sharp drop in house prices, which increased the chance that in case of forced sale the value of a house would be lower than the remaining mortgage balance.

At year-end 2016, the aggregate balance of mortgage loan guarantees amounted to approximately €193 billion, for a total of 1,309,000 active guarantees. In 2016 the NHG guarantee fund reimbursed a total of €109 million of losses, an average of €34,000 per case. The net assets of the fund then amounted to €960 million.

Instead, we believe it is important to pay due attention to a second policy parameter, technically known as the NHG cost limit, or a price ceiling for insurable property. This ceiling, in combination with the maximum LTV, determines the amount of debt that individual first-time homebuyers under the NHG scheme can take on. The ceiling is set such that an average home in the Netherlands can be

Box 2: The Dutch mortgage market

In Box 1, we discussed specific features of the NHG. These will only be understood well when the more general context of the Dutch housing market is explained.

In addition to the MID and LTV caps mentioned in this paper, there is also a DSTI cap (debt service to income ratio). This allows households, depending on their income and current interest rates, to borrow amounts equal to 4 to 5.5 times annual earned income. Part of secondary income is also considered. This means that following a divorce, spouses could be forced to either sell the house or keep joint responsibility of the mortgage if the income of one spouse alone is no longer enough to qualify under the DSTI cap regulation. These caps are only checked at mortgage inception.

Two more situations are worth mentioning. First, residual debt is portable. If a person moves from an underwater mortgaged home to a rental home, there will still be residual debt, even though no collateral exists anymore. In this case the mortgage interest is still fully tax-deductible. Second, as of 2013, only new linear and annuity mortgages qualify for the MID. However, there is a large legacy from the past in terms of interest-only loans (about 60%), investment loans (about 7%), and saving loans (about 25%) that received particularly favorable tax treatment.

bought. A loan applicant who wishes to buy a more expensive home will not qualify for NHG coverage. To keep up housing and mortgage demand, the pool of borrowers eligible to purchase the default insurance was enlarged in 2009. This was done by increasing the price ceiling for NHG qualification from €265,000 to €350,000. This change was reversed through adjustments a couple of years later. In 2015 the ceiling was reduced again to €245,000.

The requested relaxation of the LTV cap by the Dutch Parliament essentially implies that homebuyers will take on additional debt, again exceeding the value of the underlying collateral. This request was accompanied by at least four additional initiatives in the same direction. These are 1) allowing additional debt linked to the property rather than to the borrower for environmentally-friendly home improvements, 2) prohibiting a bank-imposed fines for borrower-induced renegotiation of interest rates before maturity, 3) partial re-introduction of interest-only (IO) loans for starters, and 4) relaxing of the debt-service-to-income (DSTI) ratio caps for the middle class. This last measure has already been effected. Box 2 provides more details.

In this study, we only focus on the opportunity to increase the LTV cap for NHG qualifiers, but our concerns about the effect of excessive indebtedness apply also for the other measures listed above, which we do not discuss further.

Does the drop in market share of the NHG result from the lowering of the maximum allowed indebtedness, as the political debate suggests? We provide in this study several pieces of empirical evidence that contradict this view. However, even if reduced indebtedness were the reason for the lower NHG insurance take-up, there are different policy options to increase the take-up again other than increasing indebtedness, which has several drawbacks.

We show evidence in support of the view that the reduction in NHG market share is due to two separate factors. First, the simultaneous increase in housing prices and reduction of the NHG price ceiling has reduced the number of first-time homebuyers who are eligible for the insurance. Second, the interest rate discount that NHG borrowers with a low LTV enjoy has nearly disappeared. We believe that there is no reduction in NHG participation due to the current LTV cap.

What is more, in the second part of the paper we show that raising indebtedness above the 100% LTV limit, thus increasing the risk to go or remain underwater, can be conducive to moral hazard. This has to do with the fact that home owners who are left with residual debt after the sale of their home can apply for cancellation of their debt under certain circumstances. One of those is divorce.

Moral hazard undermines the functioning of the insurance market and drives premium levels up. In our context it occurs when insured homeowners choose to divorce in case of residual debt. We label this strategic divorce. It encompasses both persons who divorce for financial gain and those who become less financially constrained in their genuine divorce plans due to the insurance. To determine whether this actually happens, we compared the divorce rates of those who qualify for the NHG scheme to comparable homeowners who are not covered. In many empirical insurance studies, it is difficult to isolate the effect of moral hazard from that of adverse selection (those with high-divorce probability applying for NHG). With NHG participation rates of almost 90% upon qualification, adverse selection is of no concern in our context. Our results show that the chance of strategic divorce increases the hazard rate of divorce by one third, from 1.41% to 1.85% of married couples annually.

We then show a number of negative outcomes that could occur more frequently when divorces increase. Divorce clearly entails major direct costs, but it is beyond the scope of this study to conduct a cost-benefit analysis at the household level, mostly because purely strategic divorces/separations could actually involve no costs at all. We will show how certain basic indicators related to utility costs, such as hours of work of divorcees, their disposable incomes, and home ownership rates, change upon divorce.

The study is organized as follows. Section 2 introduces the data that we use and presents descriptive evidence. Section 3 contains the empirical results of our study of the hazard rate leading to divorces. Here we also discuss the costs of divorces in terms of economic outcomes across the life cycle. Section 4 summarizes the main results, discusses policy options, and contains our conclusions.

2. Data and descriptive evidence

2.1 Data

Our analysis of NHG participation is based on loan level data (LLD) of De Nederlandsche Bank (DNB), the Dutch central bank. This unique micro-dataset is based on the register of mortgage contracts that commercial lenders must deposit with DNB in its role as financial market supervisor. This register was established in 2012 and is available on a quarterly basis. The LLD data offers unprecedented possibilities to measure mortgage contract parameters and the evolution of the contracts. They cover 80% of the Dutch mortgage market and allow identification of NHG qualifiers and participants. NHG participation is registered for each loan that is underwritten, also in the very frequent case of multiple loans per borrower (Mastrogiacomo and Van der Molen, 2015)

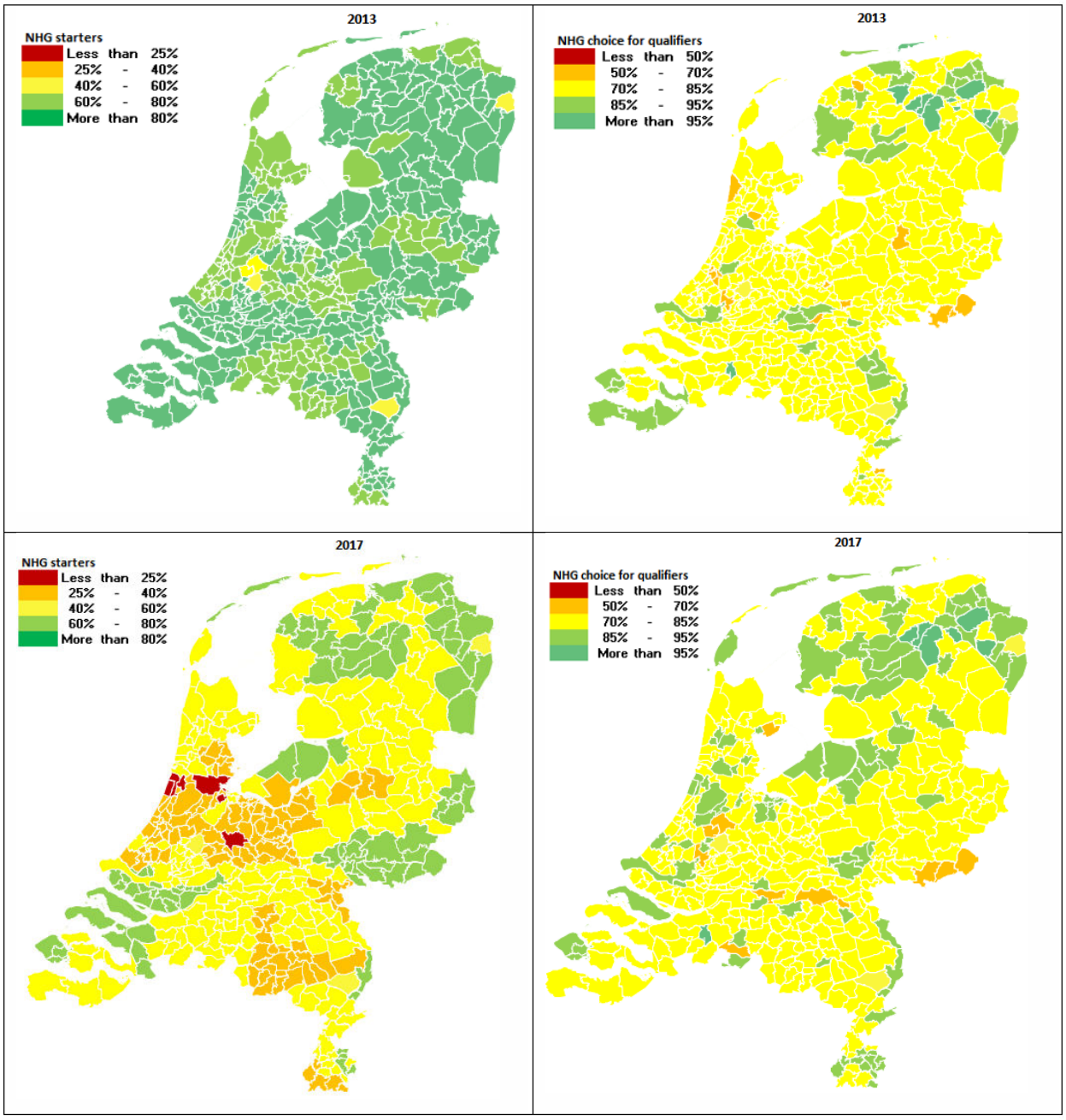
We used two additional micro-data sources for our study. These are the Dutch income panel study (Inkomenspanelonderzoek or IPO) and the DNB Household Survey (DHS) data. The IPO is an annually conducted micropanel dataset (see CBS, 2016), made available by Statistics Netherlands (CBS). We used the IPO in order to study couples who divorced or separated couples during the credit crisis. It has a number of advantages over the LLD. It is representative of the population and not only covers recent mortgage holders, but also allows measuring a number of crucial covariates of divorce at the micro level. In addition, it straddles the pre-2008 and post-2008 periods. As NHG participation is not provided in the IPO data, we use the available measure of housing wealth as it is key to determining NHG qualification. Housing wealth is available from 2005 onwards. The IPO data also do not cover the most recent years.

We used the much smaller DHS data sample for our analysis of a proxy measure of pension entitlements of divorcees. This information is also not available in the LLD or IPO. The DHS survey is representative, but small numbers of observations means that the data are less reliable. Finally, we use aggregated balance sheet information published in the annual reports of the NHG foundation.

2.2 Descriptive evidence

Figure 1 presents municipality-level aggregates based on LLD data and illustrates NHG participation and take-up. The figure has four different panels and highlights two important facts. The upper left panel shows the share of NHG participants among starters in different municipalities in the first quarter of 2013 (Q1 2013 hereafter). The lower left panel shows the same share but in Q4 2017.

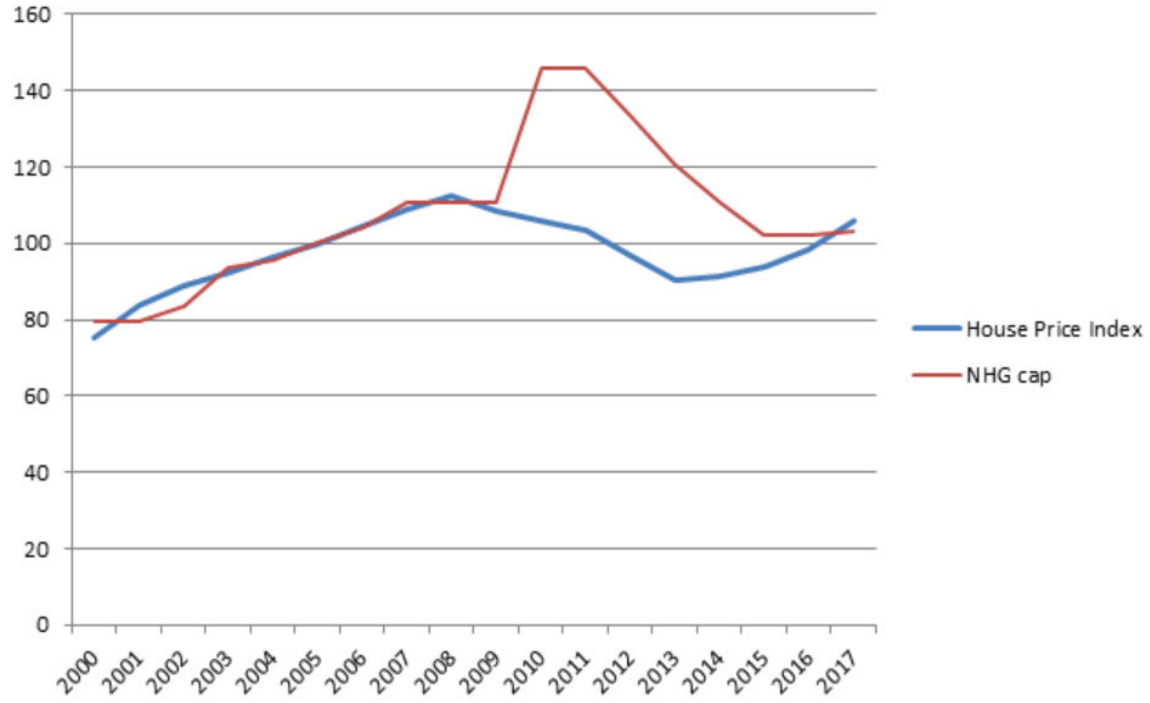
Figure 1: Percentage of NHG participants and take-up rate among NHG qualifiers, by municipality



Explanatory note: The left panels of this figure identify the percentage of starters in the housing market who bought their homes with NHG coverage (participants). The right panels show the percentage of NHG participants who bought a house compliant with NHG norms (take-up rate among qualifiers). The data are aggregated at municipality level from the LLD micro data. Upper panels: data for Q1 2013; lower panels: data for Q4 2017.

A comparison of the two left panels explains what triggered the concern of the Dutch parliament: NHG participation among starters diminished very quickly[2]. In Amsterdam, for instance, participation dropped from about 70% to 24%. The

Figure 2: National House Price Index and NHG cap (base year 2005=100)



Source: CBS Statline and NHG annual reports, own computations.

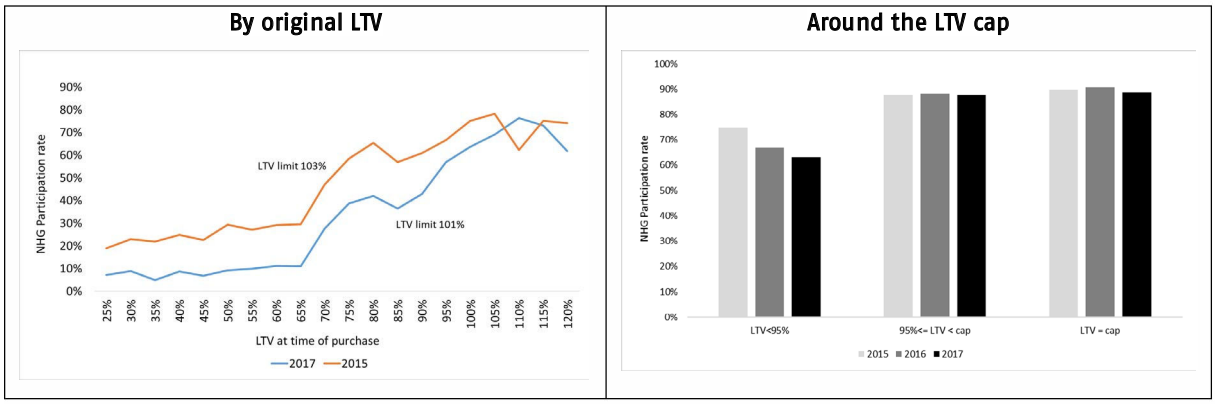
upper-right and lower-right panels show the share of participants among NHG qualifiers in Q1 2013 and Q4 2017 respectively, i.e. the share of those who bought a house with a price not exceeding the official threshold. As explained in Box 1, the NHG price ceiling was sharply lifted in 2009 and lowered again in 2015. People who bought a house in 2017 appeared approximately as likely to make use of the NHG insurance as buyers in 2013; in both cases the take-up rate was about 80-90%. The gradual reduction in the LTV cap that occurred in this period did not seem to have discouraged homeowners from purchasing the NHG insurance.

This suggests that the reduced participation was not due to a drop in take-up conditional on being eligible (figures in the right panel) but due to a drop of qualification. In fact, Q1 2013 was the turning point of the housing crisis, with price levels more than 20% below the 2008 peak. After 2013, prices started to rise again, and as of Q4 2017 they were back to the pre-crisis level. The national house price index is shown in Figure 2.

Superimposed in the figure we also see the development of the NHG cap or price ceiling. The figure shows that the NHG cap tracked the changes in the house price

2 At the same time the composition of the starters pool has also changed. Analysis of the LLD (not shown here) suggests that recent starters have a higher loan-to-income ratio, lower LTV, and almost no interest-only loans anymore.

Figure 3: Mortgage insurance of starters who purchased a house below the NHG price ceiling.



Explanatory note: In 2015 NHG customers still enjoyed a large interest-rate reduction compared to non-NHG mortgage borrowers. This differential was progressively reduced and almost eliminated by 2017. Source LLD (DNB), own computations.

index closely, but that the two diverged substantially after 2009. Not visible in Figure 2 is the regional differentiation. In particular in the urban areas, prices after 2016 actually surpassed those recorded during the 2008 peak, with currently new heights on record in major cities such as Amsterdam. This suggests that the reduction in the NHG price ceiling, combined with the overall increase in prices, is a more plausible explanation for the decrease in NHG participation than the LTV cap reduction.

To assess this, we present some evidence on LTV development, again based on LLD micro data. Figure 3 focuses on homebuyers who purchased the mortgage insurance and considers their LTV. The graph on the left shows the share of NHG participants among qualifiers over the original LTV in 2015, when the LTV cap was 103%, and in 2017, when the LTV cap had been reduced to 101%.

Figure 3 shows that there is no drop in participation at higher levels of the LTV (95% and up). Instead, the drop takes place for lower levels. This is also confirmed by the graph on the right, where no drop in NHG participation is observed at the LTV cap, irrespective of the value of the cap. This fact gives rise to the question why NHG participation drops for borrowers with lower original LTV ratios. We have chosen to illustrate the difference between 2015 and 2017 for a specific reason. After 2015, a change took place in the mortgage interest rate structure. While NHG participants enjoyed a reduction of about 0.3% to 0.6% in the interest rate in most cases until 2015 (and even more for top LTV ratios), this advantage had disappeared by the end of 2017 for borrowers with an LTV not exceeding 65%. This was decided by banks, mostly because of increased competition for low-LTV loans and because of the prolonged period of low interest rates. For example, at most banks a borrower with an original LTV of 65% paid exactly the same interest rate in 2017, irrespective of whether NHG insurance had been purchased. Also, such borrower pays a one-off

initial 1% premium of the principal, as does a borrower with an LTV of 100%. This suggests a relatively high price differential for insurance, with relatively higher prices paid for default insurance for mortgages with relatively low exposure.

Rather than the reduction of the LTV cap, the elimination of the interest rate advantage induces recent starters with low LTV ratios to forego the NHG. It is plausible that their low debt level and the increasing house prices induce these borrowers to regard insurance for residual debt as useless or not worth the money. In turn, this also suggests that, prior to the elimination of the interest rate reduction, they may have purchased NHG cover not for its insurance value but to receive a lower interest rate.

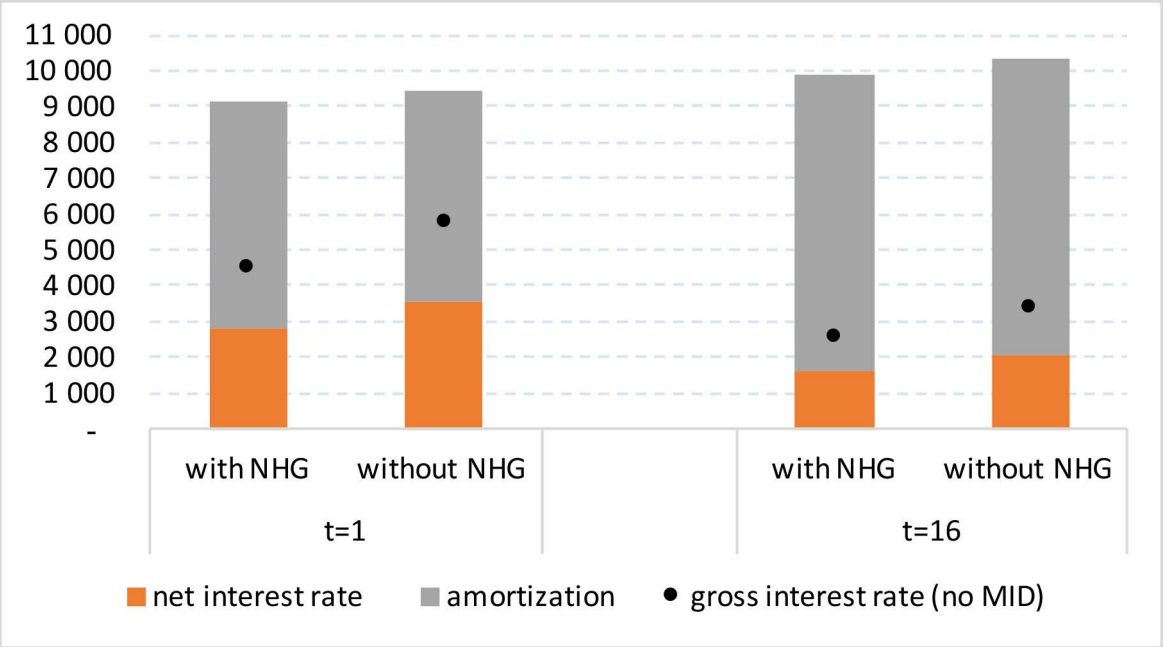
The left graph in Figure 3 also indicates a reduction in NHG participation for those with an LTV above 65% and below the cap. Why would these borrowers, who still gain from the reduction in interest rate, opt less often for NHG insurance? The answer to this question may be more subtle. Due to the current prolonged period of low interest rates, the interest rate structure has become flatter so that the interest rate discount is now lower. It is thus possible that borrowers who do a cost-benefit analysis consider the rate discount too low relative to the premium that needs to be paid upfront. This is plausible if they plan to move again in the not too distant future to a more expensive home above the NHG price ceiling, whereby they would lose the insurance cover before their loan matures.

There is yet another issue worth considering. Before 2013 many starters had a loan that only called for interest payments. This means that the interest payable on these loans stayed constant until maturity. Such loans were designed to make maximum use of the mortgage interest deductibility (MID) allowed under income tax law. As from 2013, first-time homebuyers must either obtain an annuity mortgage or a linear mortgage for the interest to be tax deductible. The LLD data show that about 90% of such starters choose an annuity mortgage, while 10% choose a linear mortgage. In either case, the advantage of an interest rate reduction drops with the age of the loan.

Figure 4 illustrates this for a fictitious loan. In the example, the borrower has obtained a 30-year annuity mortgage with a principal amount of €250,000 and a 100% LTV. We assume that the interest rate was initially 2.3% without NHG and 1.8% with NHG. We now want to compare these two situations in the first year of the mortgage and 15 years later[3]. The borrower thus benefits from purchasing NHG insurance (at a price of €2,500, 1% of the principal). In the figure, t is the age of the loan, so $t=1$ is the origination year of the loan, which we reflect in the left panel of the figure. In the right panel, we depict the case where the age of the loan is $t=16$,

3 The figures shown reflect current market conditions and are based on averages across the four largest Dutch banks.

Figure 4: Increase in net mortgage premiums with and without NHG insurance



Explanatory note: Example parameters are mentioned in the text.

so the borrower is approximately half way through the duration of the loan. In both cases we assume a marginal MID rate of 38%, corresponding to current tax law.

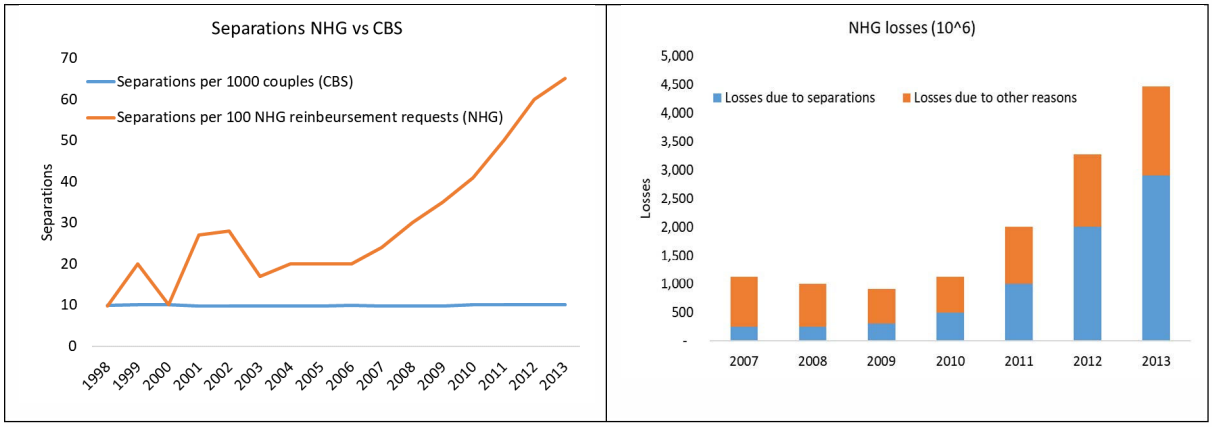
First, the MID lowers the benefit of choosing the NHG. While gross premiums are reduced by €770 in $t=1$,[4] net premiums are reduced by €295[5]. Second, as annuity premiums are the sum of principal and interest, the total net premium in $t=1$ is reduced very little (€295) whereas in $t+15$ the reduction is larger (€462). This is because, as time goes by and part of the principal is paid, the interest portion of the total premium decreases, thus magnifying the advantage of the NHG. This is partly offset by the fact that annuities allow borrowers to pay relatively more interest and less principal at origination (in this example in $t=1$, 41% of the premium is interest, while in $t+15$ this falls to 23%).

The very design of annuity products leads to the benefit of an interest rate reduction being much lower than in the case of an interest-only loan. The simple

4 Gross annual payments drop from €11,628 (which is $[2.3\% \,/(1-((1+2.3\%)^{-30}] * €250{,}000$ for the loan above without NHG) to €10,858 with NHG. The annual gross payment of €11,628 is thus the sum of gross interest of €5,750 (principal of €250,000 times 2.3% interest rate) plus principal of €5,878. The same computation applies for the payment of €10,858 with NHG, at an interest rate of 1.8%, and shows that the repayment of principal with NHG is equal to €6,358.

5 This is due to the fact that the MID reduces annual interest payments in the situation without NHG to €5,750*(1- 38%) = €3,565. The net annual interest payment in the case with NHG is by analogy equal to €2,790, while repayment of principal stays the same in both cases. This results in a reduction of (€3,565 + €5,878) - (€2,790 + €6,358) = €295.

Figure 5. NHG reimbursement increases due to divorce and nation-wide divorce rates



Source: NHG annual reports for separate years.

computations above show that, in order to find the NHG premium attractive, borrowers must keep an annuity for at least 10 years. But borrowers actually renegotiate their mortgage on average every 7-8 years. It is thus possible that a borrower with an LTV above 65% and below the cap would consider the NHG premium too expensive. In addition, the risk of getting underwater is reduced continuously through repayments of principal, which in turn reduces the demand for default insurance.

So far, we have only considered that the reduction in market share of NHG insurance is not linked to the reduction in LTV caps. Increasing the LTV cap above 100%, as the current policy initiative suggests, would lead again to higher debt levels and a higher risk of underwater mortgages. This, in turn, could lead to a range of negative externalities (Mian and Sufi, 2014). Among the potential unintended consequences of the policy change is an increase in divorces. Remember that, if the reason for default is an unforeseen event such as unemployment, disability, and death, then residual debt upon the sale of the house can be waived by the NHG foundation. The list of permissible reasons also includes divorce. Figure 5 focuses on this issue. In the left panel, we see that divorces and separations rise steeply among NHG reimbursement requests, in particular after 2008, even though the overall divorce rate (measured as separations per 1000 couples) has remained constant.

A considerable difference between NHG claimants and the general population may be due to specific characteristics of the NHG customer pool, but the rising slope, including the growth of separations during the crisis years, is remarkable. The right graph shows the loss amounts involved the NHG fund. Losses due to separations have grown exponentially, becoming by 2013 the most important reason for NHG reimbursements.

Box 3: Moral hazard in the literature on housing and divorce

Economic theory on the family (Becker, 1991; Browning et al., 2014) suggests that divorces and separations respond to unforeseen changes in economic circumstances, and various empirical studies suggest that individual income shocks (relative between spouses), business cycle fluctuations, and changes in legislation affecting post-divorce net assets division, alimony, and custody impact divorce decisions (e.g. Becker et al., 1977; Peters, 1986; Allen, 1992; Borenstein and Courant, 1989; Stevenson and Wolfers, 2006; Allen, 2007; Hellerstein and Sandler Morrill, 2011; Hellerstein et al,, 2013).

Housing wealth is the most important component of the assets of individual couples, and housing equity thus constitutes the largest resource that is channeled into the net wealth of couples during marriage. Residential housing prices are known to be very volatile.

Transaction costs associated with purchase, sale, and relocation tend to be significant. While it is intuitively possible that in the face of large transaction costs price-induced fluctuations in home equity may be associated with lock-in effects that restrict residential mobility (Engelhardt, 2003), the institutional context is most relevant for default decisions by households with underwater mortgages (outstanding mortgage debt exceeding the market value of the housing collateral). Guiso et al. (2013), for instance, showed that it is likely that moral hazard plays a role in the US for those with large negative home equity values. They estimate that between 26% and 35% of mortgage defaults in the aftermath of the US subprime mortgage crisis can be classified as 'strategic'. Strategic default means walking away from one's liabilities (and forfeiting the underlying asset) even though income may still be large enough to service mortgage repayment plans. Bajari et al. (2011), using a structural model, predicted that a house price fall of 20% makes borrowers who bought their house one year earlier more than 15% more likely to default on their mortgage. Gerardi et al. (2018), using household survey data from the Panel Study of Income Dynamics, estimate that 38% of defaulters in fact have the funds to keep repaying their loans.

A negative wealth shock can theoretically impact the marital stability of couples through a number of channels. One mechanism pertains to lower house prices implying a decreased cost of living separately, as well as to opportunity costs including heightened financial stress (Rainer and Smith, 2010; Farnham et al., 2011; Klein, 2017). Divorces often involve new housing for the separating spouses, implying individual housing costs for both spouses. A potential mechanism working in the opposite direction is the transaction costs channel. Housing markets typically exhibit a positive correlation between price appreciation and transaction volume (Genesove and Mayer, 2001), while they freeze up during a downturn. If owners are loss-averse, they may be reluctant to sell their home when the market is in a slump (Ferreira et al., 2010; Farnham et al., 2011). Genesove and Mayer (2001) showed that nominal loss aversion is a more crucial factor than liquidity constraints to explain why there are fewer houses on the market when prices fall. They find that loss-averse sellers set relatively high asking prices, obtain high selling prices, but have a low hazard of sale. Engelhardt (2003) studied US metropolitan areas and found that loss aversion reduces residential mobility. On the other hand, underwater mortgages hinder residential mobility, as couples are subject to a "housing equity constraint" (Farnham et al., 2011, p. 616). Chan (2001) showed convincing evidence that low home equity limits mobility because of residual mortgages debt and new down payments. He also showed more pronounced lock-in effects for high loan-to-value (LTV) mortgage owners.

Farnham et al. (2011) found a significant effect of declining house prices reducing divorce risk in the US. On the contrary, Rainer and Smith (2010) showed that negative house price shocks in the UK led to significantly more divorces, especially of couples with high mortgage debt, children, and low income. More recently, Klein (2017) showed that increases in house prices enhance martial stability. She found no significant effect of negative house prices shocks on divorces.

To summarize, this section shows that the drop in NHG participation is due to lower qualification rather than a lower take-up rate for those who qualify. If any drop is observed among qualifiers, this is not due to lower LTV caps, but due to the lesser advantage derived from the NHG, for instance because most banks no longer offer interest rate discounts to NHG loan holders with LTV ratios below 65%. The lower benefits from the NHG are also for three other reasons. First, the mortgage interest deductibility lowers the net-of-tax interest rate and any discount on it. Second, borrowers receive a much lower reduction in interest rate due to the low-interest-rate situation and the compressed interest rate structure. Third, the reduction is lower because mortgages that require repayment of principal, which have replaced the popular interest-only loans, make it less likely that borrowers will stay with residual debt should they default on their loans. Finally, we also note the sharp increase in divorces/separations as a reason for claiming NHG reimbursements since the crisis, while for the Netherlands as a whole no specific increase in divorces took place. In the next section, we discuss whether this evidence suggests the presence of moral hazard within the NHG insurance scheme.

3. Empirical results

3.1 Underwater Mortgages, the NHG and Divorce

As stated in Box 1, divorce/separation is one of the permitted reasons for claiming NHG reimbursement of losses that occur upon selling a house with an underwater mortgage. This provides room for a quasi-natural experiment that we exploit in this section, as NHG qualification is only possible for houses that are bought below a legally instituted price ceiling. By comparing households above this ceiling (the control group) and below this ceiling (the treatment group), we can study the possible occurrence of moral hazard among mortgage insurance holders, who might strategically decide to divorce in order to get rid of their debt.

Debt cancellation by NHG is only allowed for underwater mortgages. We refer to the term 'underwater' in a broad sense here, as NHG also reimburses residual debt for homes sold (at auctions) at liquidation value, even though the property could fetch a higher price on the market. In a regression framework, we then would control in particular for the group that is both insured and has an underwater mortgage.

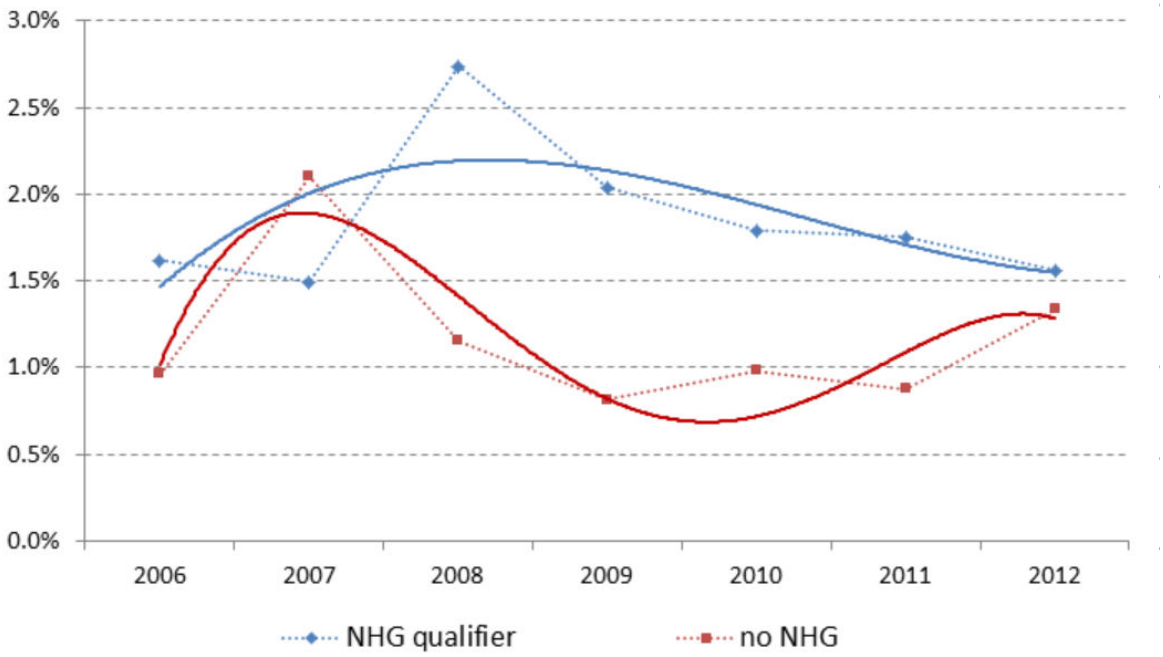
This approach might not be enough to capture the full extent of the problem. The reason is that, prior to 2008, underwater mortgages were mainly a consequence of LTV ratios exceeding one, which was common for new contracts. This meant that many of the underwater cases in those days were not expected to become problematic or to result in default. However, this changed in response to the financial crisis, when negative home equity became very quickly a widespread phenomenon. We therefore control for the crisis effect separately. During the crisis not only the number of situations involving negative home equity increased, but also their value dropped, reaching about €50,000 on average (about 20% of the mean value of a home property in 2013).

In this second approach, we therefore focus on the effect of NHG on divorces of couples with underwater mortgages after 2008. We compare these with those that were not underwater, that did not have NHG coverage, and that were observed before 2008. Figure 6 shows the hazard rate into divorce of Dutch couples (underwater mortgage owners) with and without NHG insurance in the IPO data for the 2006-2012 period.[6]

The figure shows a limited number of annual transitions from couple to single (about 1%-2%) and a higher hazard of NHG qualifiers in all years except for 2007. In this figure, we include all borrowers, but the pattern shown is the same (but noisier) if we restrict the sample to a closer proximity of the threshold. The higher

6 The reason for limiting the study to this period is that no lagged wealth data are available for the period prior to 2006 (which are needed to assess the underwater status prior to divorce/separation), while from 2013 onwards house prices started to increase again.

Figure 6: Hazard rate into divorces of Dutch couples with underwater mortgage, before and after the financial crisis.



Explanatory note: Pre-crisis means do not differ significantly. Source: IPO (CBS) and own calculations.

hazard turns into evident divergence during the crisis, when we observe a significantly larger hazard into divorce/separation for NHG qualifiers.

3.2 Empirical test of moral hazard

We formally test whether NHG participation induced strategic divorce among couples with negative home equity. We begin by specifying an empirical model as:

$$y_{i,t} = \beta_0 + \beta_1 NHG_{i,t-1} + \beta_3 UW_{i,t-1} + \beta_5 (NHG_{i,t-1} * UW_{i,t-1}) + \beta_8 GAP_i + \beta_9 GAP_i^2 + \beta'_{10} X_{i,t-1} + \beta'_{11} Z_i + \gamma_{regional\ house\ price_growth_t} + \varepsilon_{i,t} \quad (1)$$

Here, $y_{i,t}$ is a dummy variable that indicates whether (1) or not (0) couple i divorces or separates in year t, if married or cohabiting in $t-1$. The hazard rate into divorce is made up of different elements. $NHG_{i,t-1}$ is an indicator for the NHG qualification in $t-1$.[7] We include it because we are interested to see whether there is a potential

7 In order to impute NHG qualification, we proceed as follows. In the income data of IPO 2000-2012, we elicit the inception year of the mortgage by looking at the year in which the interest rate on the mortgage is first reported. This procedure identifies the year of inception in about 20% of all cases. We then either observe the value of the house (if the year is 2005 or later) or

difference between borrowers that take out the insurance, and those that do not. There are many reasons why these groups may display differing divorce behavior even in the absence of an underwater mortgage, and even when not making a claim, depending on observables. Perhaps the group is characterized by differential risk aversion and demand for insurance, perhaps there are lifecycle risks associated with early career stages and family formation that we cannot control for directly. $UW_{i,t-1}$ is a dummy variable for households whose outstanding mortgage debt exceeds the market value of the housing collateral, the so called underwater (UW) status. Negative home equity may put couples under stress and threaten marital stability, but conversely it may also lock two partners into a marriage that would otherwise dissolve. Of particular interest is the interaction term, $NHG_{i,t-1} * UW_{i,t-1}$, which captures the specific divorce behavior of couples who see their home going underwater but who may default and request a bail-out from the NHG fund. We assume that neither NHG nor UW status can be manipulated by the household. Using lagged values for these variables mitigates potential endogeneity problems, as it makes sure that divorce and property loss occurs after qualifying for NHG insurance. The parameter on this interaction term, β_5, is the main parameter of interest in Model (1).

To reduce potential contamination by an effect of important correlated variables, we control for a range of other observable factors. GAP_i denotes the relative difference between house value at inception and the NHG price ceiling. This variable is relevant because it indicates the effect of proximity to the point of discontinuity (the threshold). We include also its square term.

Divorces will in important ways be a function of individual and match-specific characteristics that we wish to control for. We add regressors $X_{i,t-1}$ consisting of a set of time-varying characteristics of couples in year $t-1$, as well as regressors Z_i denoting time-invariant variables. In X, we include a dummy on having any children, a quadratic term in the log of age of the head of the family (or the partner), and a quadratic term in the log duration of the current marriage. In Z, we include the age at the start of the current marriage. These are meant to control for life cycle position, duration dependence, and initial condition of the marriage. It is also important to control for a measure of the household's total disposable income, and the intra-household distribution of resources (the difference between household and personal income), as the latter may directly influence intra-household bargaining weights and be an important driver of marital dissolution. In addition, we include an employment dummy.

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impute it using a province-level house price index (if the year is before 2005). We then impute the NHG qualification, applying the IPO data on paid interest rates on mortgages also prior to 2000 (back to 1993) with the same method above. We can thus identify the purchase year (and thus determine NHG qualification) for around 40% of the sample.

Lastly, the growth rate of the regional house price index is included in our model to capture generic time effects. $\varepsilon_{i,t}$ is an error term and allows for individual-specific time-variant heterogeneity through a random effects component. Parameter β_5 then measures the causal effect of being insured at the NHG threshold at the time of divorce. Depending on GAP, it is a local effect comparing qualifying and non-qualifying households with similar home values relative to the NHG qualification ceiling.

In a second specification we also include an indicator for the crisis period, $Crisis_t$, meaning the period from 2008 onwards, when house prices dropped by more than 20%. We also include interaction terms. The reason for doing so is that the phenomenon of underwater mortgages becoming widespread and leading to a substantial number of defaults only occurred during the crisis,. The model equation is

$$\begin{aligned} y_{i,t} = \beta_0 + \beta_1 NHG_{i,t-1} + \beta_2 Crisis_t + \beta_3 UW_{i,t-1} + \\ \beta_4(NHG_{i,t-1} * Crisis_t) + \beta_5(NHG_{i,t-1} * UW_{i,t-1}) + \beta_6(Crisis_t * UW_{i,t-1}) + \\ \beta_7(NHG_{i,t-1} * Crisis_t * UW_{i,t-1}) + \\ \beta_8 GAP_i + \beta_9 GAP_i^2 + \beta'_{10} X_{i,t-1} + \beta'_{11} Z_i + \gamma_{regional\ house\ price\ growth,t} + \varepsilon_{i,t} \end{aligned} \quad (2)$$

Economic theory predicts (see Box 3) that divorces respond to economic conditions, including macroeconomic fluctuations. This is the base effect picked up by β_2. It will pick up some variation that in Model (1) had been picked up by the regional house price variation. The interaction with $NHG_{i,t-1}$, parameter β_4, takes out a differential NHG effect during the crisis, for instance the fact that the price ceiling for new mortgages was raised, or that insurance became more expensive. The interaction with $UW_{i,t-1}$, parameter β_6, measures the generic underwater effect on divorce during the crisis. Finally, the triple interaction, parameter β_7, is the parameter of interest in Model (2). Again, we interpret it as the causal effect on divorce of being NHG-qualified and exposed to negative home equity during the crisis. It measures how much higher or lower the divorce hazard is among NHG participants with an underwater mortgage when the phenomenon was widespread. It therefore is an indicator of strategic divorce (moral hazard).

For both models, note that we do not observe whether NHG has actually been taken up, as the IPO data are silent on this. We reiterate, however, that take-up rates conditional on qualifications have traditionally been very high (see Figure 1). Our sample window excludes the most recent years where selection effects may be more likely to occur. We do not observe default, but only negative home equity. Hence, we may overestimate the effect on divorce if we were solely interested in households that are actually insured and that are effectively bailed out with debt relief.

Table 1: Estimation results of divorce hazard at current time (t)

Dependent variable: dummy for divorcing couples	Model 1	Model 2
NHG Qualification Indicator$_{t-1}$	0.0038 (0.0034)	0.0049 (0.0040)
After Crisis (year>=2008)		0.0059*** (0.0026)
Underwater Households$_{t-1}$	0.0009 (0.0027)	0.0017 (0.0049)
NHG Qualification$_{t-1}$ × After Crisis		−0.0019 (0.0032)
NHG Qualification$_{t-1}$ × Underwater Households$_{t-1}$ (β_5)	0.0025 (0.0034)	−0.0101 (0.0065)
After Crisis × Underwater Households$_{t-1}$		−0.0001 (0.0053)
NHG Qualification$_{t-1}$ × After Crisis × Underwater Households$_{t-1}$ (β_7)		0.0153** (0.0069)
Log of Marriage duration$_{t-1}$	0.0175*** (0.0034)	0.0178*** (0.0034)
(Log of Marriage duration) squared$_{t-1}$	−0.00001 (0.0016)	−0.0007 (0.0016)
Age at start of current marriage	0.0015*** (0.0005)	0.0013*** (0.0005)
Child dummy$_{t-1}$	0.0180*** (0.0029)	0.0180*** (0.0029)
Disposable income household$_{t-1}$	0.0093 (0.0067)	0.0084 (0.0067)
Difference between household and personal income$_{t-1}$	0.0269*** (0.0061)	0.0270*** (0.0061)
Log of Age$_{t-1}$	0.6409*** (0.1399)	0.5690*** (0.1386)
Log of Age squared$_{t-1}$	0.0984*** (0.0198)	0.0874*** (0.0196)
Employment$_{t-1}$	−'0.004 (0.0029)	−0.0042 (0.0029)
GAP (between House prices and NHG limit)$_{t-1}$	−0.0003 (0.0021)	−0.0001 (0.0021)
GAP squared$_{t-1}$	0.0001 (0.0001)	0.00001 (0.0001)
Regional house price growth rates	0.0816*** (0.0178)	−0.0183 (0.0242)
Constant	1.0668*** (0.2523)	0.9461*** (0.2503)
Number of Observations	26,560	26,560
Number of Couples	6,341	6,341

Explanatory note: robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10

Table 1 shows regression results for the two equations above. The left column refers to the first model (1), the right column to the second model (2). Many of the common coefficient estimates between the two models are very similar, in particular those of taste shifter controls. The table shows the importance of structural demographic determinants of divorce. In particular, the hazard rate into divorce correlates positively with log marriage duration and age at the start of the

current marriage, and negatively with a child dummy, as well as with the difference between household disposable income and personal income.

With regard to the log variables and log-squared variables, we also calculated marginal effects at the sample means. The marginal effects of marriage duration and age of the head of the household are 0.0017 and 0.0069 respectively.[8]
The baseline effects for NHG and having an underwater mortgage are statistically zero, whereas the crisis coefficient in model (2) is positive and significant. Note that 'regional house price growth' has a strongly negative coefficient in model (1). On the contrary in model (2) this effect is non-significant, but the dummy that identifies the years of crisis is. The latter, together with some additional interaction terms, could be picking up part of the effect that in model (1) was being picked up by the variable regional house price growth.

The coefficient $ß_7$ in Model (2) is positive and significant, meaning that we find during the crisis NHG participation had a positive causal effect for the group of underwater borrowers on divorce. This is consistent with moral hazard in the form of strategic divorce.

Note, however, that in Model (1) the corresponding causal effect of NHG participation when the mortgage is underwater, $ß_5$, is positive but not significant. In model (2), $ß_5$ is negative and borderline insignificant. One possible interpretation of this negative sign, though insignificant, is the effect of house price expectations before the crisis. Here, couples that started out with highly-leveraged negative home equity may not have expected to end up in a problematic debt situation, as house prices showed a sustained upward trend for many years until 2008. The turnaround came quickly and took many by surprise.

Our two models both fit the mean hazard closely. Both models deliver similar predictions. Model (2) predicts that the hazard rate into divorce is 1.85%. When we set the coefficient $ß_7$ to zero in the prediction, to eliminate the effect of moral hazard, the hazard rate drops to 1.41%. This means that moral hazard has increased the hazard rate into divorce by about 0.44 percentage points (a relative effect of about 31%).

Table 2 shows summary statistics of two different groups (NHG qualifiers and NHG non-qualifiers) in our estimation sample. Background characteristics are listed and

8 The marginal effect of marriage duration derives from both log duration of the current marriage and quadratic term in the log duration of the current marriage. The former is calculated as its coefficient in Model 2 multiplied by a reciprocal of the sample mean of the marriage duration, which is 0.0178*(1/10.12) =0.0018. The latter (quadratic term) is estimated as follows: -.0007*2*log(10.12)*(1/10.12) =-0.0001. Therefore, the marginal effect of the marriage duration would be the sum of those two estimated numbers (0.0018-0.0001=0.0017), even though the coefficient of the latter one (quadratic term in the log duration of the current marriage) was not statistically significant. The marginal effect of the age of the head of the household (or partner) is also produced in the same way: (0.569*(1/41.4) - 0.0874*2*log(41.4)*(1/41.4)= 0.0069).

Table 2: Summary statistics of NHG qualifiers and non-qualifiers in the estimation sample: means and standard errors

Background Characteristics	NHG qualifier	NHG non-qualifier
Log of Marriage duration	1.79 (0.90)	2.05 (0.85)
(Log of Marriage duration) squared	4.03 (2.96)	4.93 (2.97)
Age at start of current marriage	30.71 (7.02)	33.5 (7.04)
Child dummy	0.73	0.7
Disposable income household ($\times 10^5$)	0.39 (0.16)	0.56 (0.37)
Difference between houshold and personal income ($\times 10^5$)	0.21 (0.14)	0.3 (0.29)
Log of Age	3.65 (0.24)	3.77 (0.22)
(Log of Age) squared	13.37 (1.78)	14.26 (1.68)
Employment	0.87	0.88
GAP (between House prices and NHG limit)	-0.23 (0.29)	1.03 (1.24)
GAP squared	0.14 (0.25)	2.61 (13.95)
Regional house price growth rates	0.003 (0.03)	0.009 (0.03)

Explanatory note: standard errors in parentheses, Source: IPO (CBS), own computations

compared in order to check whether there is a sizable difference between two groups. Most of the characteristics of the two groups are similar in terms of means and standard errors. An exception pertains to disposable income, which correlates with the value of the property. Couples in the NHG non-qualifier group have more valuable houses and are more likely to have higher incomes. The GAP variable is also higher for the NHG non-qualifier group. The marriage-relevant variables, such as marriage duration and age at start of the current marriage, indicate that NHG non-qualifiers get married at a somewhat later age and stay married somewhat longer.

We have subjected the empirical results shown in Table 1 to a range of robustness checks in order to see whether and under what conditions the causal effect survives when we change sample and specification. In specification A, we depart from the baseline sample and extend the sample to include the 1993-2000 period. For these additional years the NHG qualification is imputed from predicted house prices in the past (imputed until 1993). We use regional house price indices for this prediction. The sample we use is three times larger than the baseline sample (referring to observation number (N) in the right hand column of Table 3).

Specification B uses a different hazard concept: not into divorce, but into divorce and separation, thus including cohabiting couples rather than only couples that were married in the previous year. In Specification C, we make the sample house values more comparable in the sense that we select observations that are closer to the NHG qualification ceiling. Whereas in the baseline model of Table 1, the distance from that threshold is solely controlled via the variable GAP, in specification C1 we

Table 3: Different specifications and robustness checks

Coefficient of NHG qualification × Year>=2008 × Underwater households (β_7)	Coefficient	N
Baseline Estimation	0.0153**	26 560
Panel A: augmented sample using house values before 2000	0.0093*	76 721
Panel B: separation hazard (using couple identifier)	0.001	38 873
Panel C: NHG qualification with range		
1.between 50_100 vs 100_150	0.0165*	20 583
2.betwween70_95 vs 105_130	0.0093	12 023
Panel D: anticipation effect		
underwater mortgages started from 2007 (Year>=2007)	0.0095	26 560
Panel E: placebo effect	-0.0183***	26 560
Would have NHG if the house value at purchase is above the median house values of that year		

Explanatory note: *** p<0.01, ** p<0.05, * p<0.10

reduce the sample to those couples that are within 50% of the qualification ceiling on either side. Specification C2 narrows the range even further, to the nearest 30% within the threshold; in addition, we exclude the narrow band of 5% on either side of the threshold. This is because the indicator of NHG qualification itself is partly imputed.

Specification D assumes that the financial crisis started one year earlier. We use this in order to test whether there may have been anticipation effects of the crisis. Specification E allows studying placebo effects. We assign the NHG isurance to all those couples with house value above the median. Table 3 presents the results on the various exercises. All deviations are relative to the baseline in Table 1. We focus solely on the parameter of interest, $ß_7$ in Model (2).

We see that the moral hazard effect survives when we use the larger sample in Specification A, although the effect is reduced relative to the baseline. Under classical measurement error this is expected. In Specification B we find no effect. Notice that there are far more separations than divorces, and the moral hazard problem may just not be very relevant for this larger group. On the other hand, the separation indicator is somewhat noisier, as identification of couples is more difficult than observing marital status, again possibly pointing to a typical measurement error effect.

Specification C1, on the other hand, is very close to the baseline in both level and statistical significance. Specification C2, which reduced the sample considerably even further (refer to N in Table 3), also shows a positive, although weakened effect on divorce, but with a relatively large standard error. Specification D shows that behavior is predicted to have been very different if we had assigned the crisis period to have started a year earlier. Now, of course, we contaminate actual

behavior from 2008 onward with some of the pre-crisis behavior. The resulting coefficient estimate is zero.

Specification E shows a negative coefficient when we create an artificial treatment group based on medial house prices alone; a finding that in itself is not surprising.

3.3 Reunions

In the context of strategic divorce it is also interesting to check whether separating couples reunited more frequently during the crisis years. We took all those who divorced in 2009 or 2010 and looked at the identity of their partners in 2013. We counted those that had the same partner as in the base year. We conducted a similar count for couples that divorced in 2002 or 2003 and look at their partners in 2006. We were able to establish the identity match by comparing personal identification numbers, but we could also simply base the comparison on sex and year of birth.

The first panel in Table 4 shows that about 1/3 of those who had divorced were no longer single three or four years later. About 6% of the total were again living with the same partner (person with the same identification code in the data). This finding is corroborated in the second panel, where we checked matches in 2014 instead of 2013. For the 2002/2003 versus 2006 comparison, we found that a smaller fraction (3.7% of total) reunited. This comparison is consistent with strategic divorce behavior during the crisis years. Note, however, that for a cleaner comparison we should condition on having an NHG and being underwater—an exercise that is precluded by the small number of observations.

In order to check that CBS did not re-assign the old code to a different partner, we checked that the previous partner's year of birth also coincided. This was the case and if we were to identify the new partner by sex and year of birth only, the reunion rate would actually be slightly higher (7.1%). See the last panel in Table 4.

3.4 The (indirect) costs of a separation

Above, we conducted a quasi-natural experiment to show how the combination of negative home equity and mortgage-default insurance can cause moral hazard. We discussed how the average negative home equity of €50,000 could be reason enough for strategic divorce, but we did not discuss the associated costs. As discussed in Box 3, the literature is divided as to the outcome of such a cost-benefit analysis. In the case of the strategic divorce/separation that we describe, it is unlikely that the costs would be high. This is because the couple involved is not

Table 4: Reunions in the IPO data

1. In terms of identification number	
divorce in 2009 or 2010 and reunion in 2013	
single in 2013	650
couple in 2013 (but with different ID code than before)	247
reunion in 2013	59
Total	956
reunion rate	6.20%
divorce in 2009 or 2010 and reunion in 2014	
single in 2014	618
couple in 2014 (but with different ID code than before)	279
reunion in 2014	55
Total	952
reunion rate	5.80%
Comparison: divorce in 2002 or 2003 and reunion in 2006	
single in 2006	561
couple in 2006(but with different ID code than before)	325
reunion in 2006	34
Total	920
reunion rate	3.70%
2. In terms of year of birth	
divorce in 2009 or 2010 and reunion in 2013	
single in 2014	650
couple in 2014 (but with the same year of birth as before)	235
reunion in 2014	68
Total	953
reunion rates	7.1%

Source: CBS, own computations

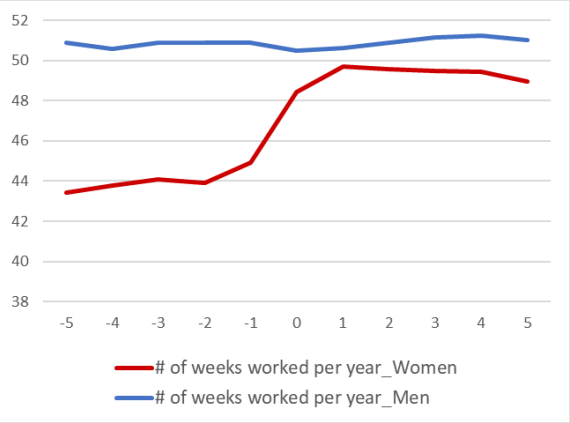
necessarily married, so that the separation can actually take place through a simple change of address. The costs involved can be low (although the robustness checks in Table 3 suggest no significant effect of moral hazard). The costs of a non-strategic divorce/separation may actually be substantial and exceed the direct monetary costs, such as legal fees (see Appendix 1).

In the IPO data, we cannot observe any relevant parameters for the marriage or cohabitation arrangement (such as community of property). We therefore discuss some of the opportunity or utility costs of divorce by investigating the evolution of several life-cycle outcomes, such as employment, income and wealth before and after a divorce, and a proxy of the retirement position of divorcees.

We present several figures that show economic outcomes ranging from five years before to five years after a divorce takes place. Note that all figures that we show are based on the strict definition of divorce and are thus conditional on having been married. Very similar figures can be produced when we look at separations more broadly.

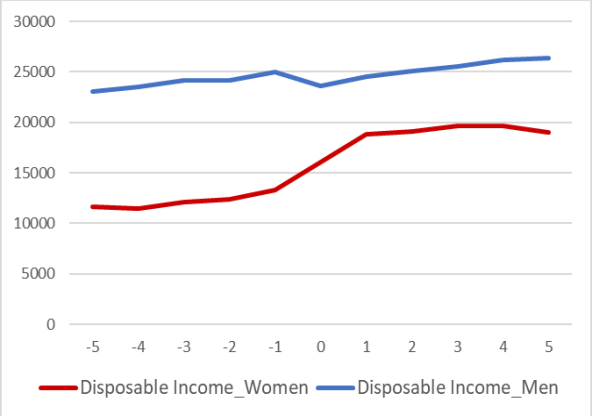
We start with labor market outcomes. Figure 7 shows clear discontinuity in the number of weeks worked by women, but not men, around the time of divorce. Prior to divorce, women work fewer weeks per year, whereas after divorce the number of weeks that they work becomes comparable to that of men. So, if the preferences of

Figure 7: Labor market participation by time before/after divorce



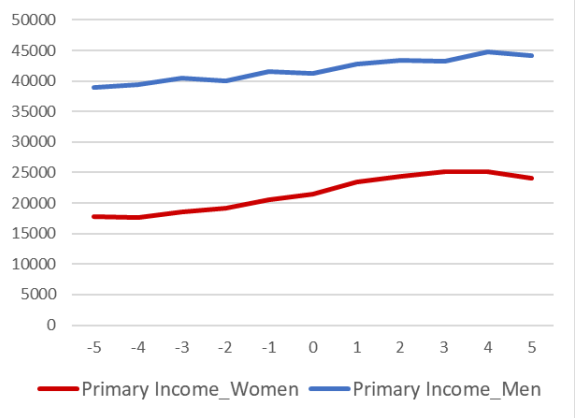
Source: IPO (CBS), own computations.

Figure 8a: Disposable income by time before/after divorce



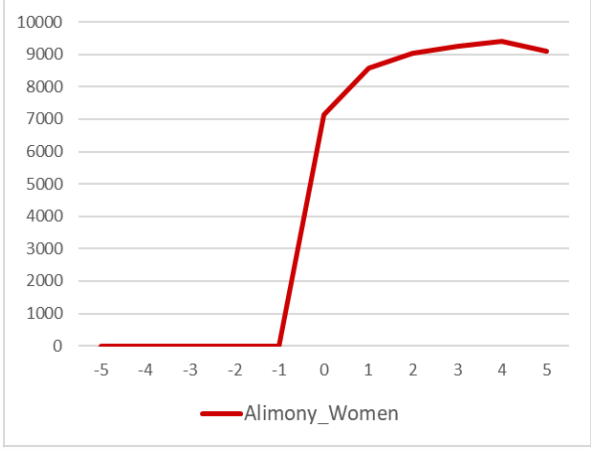
Source: IPO (CBS), own computations.

Figure 8b: Primary income by time before/after divorce



Source, IPO (CBS), own computations.

Figure 8c: Alimony by time before/after divorce



Source, IPO (CBS), own computations.

women were satisfied by their labor supply before the divorce, increasing the number of hours of work might entail a utility/welfare cost.

This effect translates into the pattern of disposable income for men and women in Figure 8a. Prior to divorce, men earned approximately twice as much as women. This difference becomes less after divorce. When we exclude insurance benefits, transfers, and taxes, the difference in primary income between men and women becomes even larger. As for alimony (see Figure 8c), women receive this as from the time of divorce, even though we observe a moderate reduction a few years into divorce. Since men seldom receive alimony, the related observations are excluded (see Appendix 2 for details about alimony regulations).

In Figure 9 we take two wealth proxies into account: one for housing wealth and one for pension wealth. Figure 9a shows housing wealth in terms of homeownership rates. On average, men remain homeowners more often compared to female spouses.

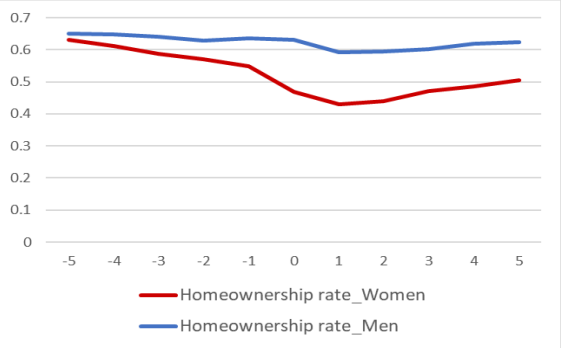
For retirement and pension related information, we use the much smaller and noisier sample of the DHS survey data, since IPO register data are not informative along this margin.

In Figure 9b, we proxy the retirement position of divorcees by looking at their self-reported probability to work until age 65. This is higher for women in the pre-crisis period. In Figures 9c and 9d, we look at the years of contributions in the second pillar pension system by gender and marital status. These two figures show that while single men constitute the group with the lowest number of years of contributions, single women are actually the group with most years of contributions at all ages. We focus on female contributions and on the group of single women (those who were never married). We have limited our sample to those aged 35-50. The graph shows that after age 45, divorced women have significantly lower contributions compared to women who never married, the difference being about 3-5 years. As in both cases (never married and divorcees) the two groups are single, part of this difference might be explained by the effect of divorce. However, in the absence of identifying exogenous variation in pension rules across these groups, the effect does not have a causal interpretation. More generally, this descriptive evidence suggests that divorced women may have to work longer, possibly due to lost entitlements during their marriage. However, as the data are sourced from a survey, the differences in answers may also be influenced by different response behaviors regarding expected probabilities across the sexes.

To summarize this section, we have discussed how divorce/separation may entail several cost components in addition to the immediate monetary ones (such as relocation and legal expenses). These costs are associated with variables such as leisure or housing wealth (which diminish, mostly for women), income (lower for men due to alimony), and retirement position (chance of working longer increases,

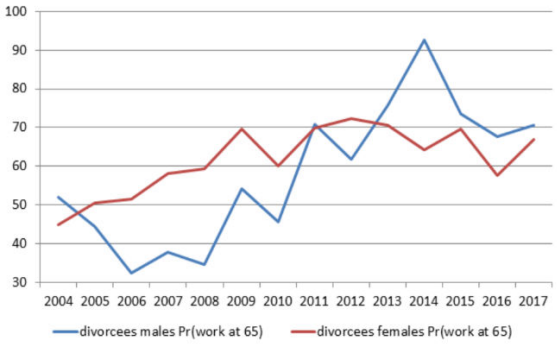
mostly for women). Any institutional design that rewards separation is thus likely to trigger these negative outcomes.

Figure 9a: Homeownership by time before/after divorce



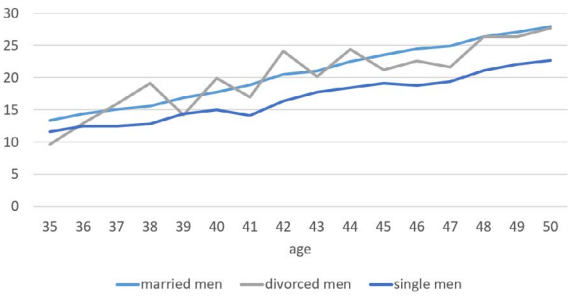
Source: IPO (CBS), own computations.

Figure 9b: Subjective probability to work till age 65.



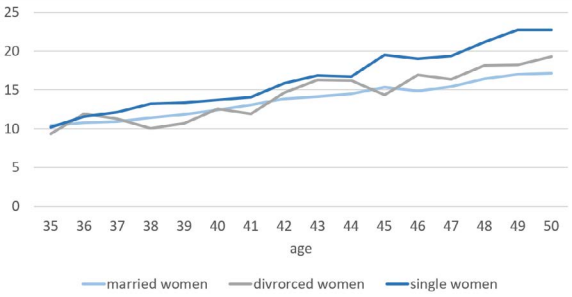
Source: DHS (CenterData), own computations.

Figure 9c: Years of pension contributions (men aged 35-50)



Source: DHS (CenterData), own computations.

Figure 9d: Years of pension contributions (women aged 35-50)



Source: DHS (CenterData), own computations.

4. Discussion and Conclusions

The Dutch Parliament appears to be concerned about the reduced access of first-time homebuyers to the housing market in this time of high and sharply rising house prices. One indicator that policymakers target is the share of NHG participants, which has dropped significantly in recent years. Members of parliament explicitly associate this observation with the fact that the LTV cap has been reduced in steps and now stands at 100%. Using unique microdata that cover most mortgage contracts, we discussed in the first part of this paper whether this assessment is justified.

The public policy response to this assessment is to relax the restriction again, along with a range of ancillary measures that will lead first-time homebuyers to take on more debt. In the case of a higher LTV ratio, higher average indebtedness results from the fact that many mortgage borrowers tend to fully use the scope for borrowing that policy allows. This may also fuel housing demand and hence drive prices up further.

We have found that the drop in NHG participation is due to tighter qualification rather than to lower take-up for those who qualify. If any reduction is observed among qualifiers, this is not due to lower LTV caps, but to the lesser benefit derived from the NHG, for instance because an NHG loan with an LTV ratio below 65% no longer provides any additional benefit. The lower gains from the NHG are also due to three other reasons. First, the tax deductibility of mortgage interest reduces the effect of the NHG as it lowers the effective interest expense. Second, borrowers receive a lower reduction in the interest rate – much lower than before – due to the low-interest-rate environment, mostly so for low-LTV mortgages where the reduction has actually disappeared. Third, the reduction is lower because annuities, that have replaced the old interest-only loans, make it unlikely that borrowers will stay with residual debt, should they ever default on their loans. We thus find no evidence that lowering the LTV cap induces less mortgage-default insurance.

We have also analyzed the reasons for the very noteworthy but hardly discussed fact that divorce has increased disproportionately among NHG participants and qualifiers. We have estimated the causal effect of NHG qualification on divorce and show that the scheme induces moral hazard. The effect on the hazard rate into divorce is considerable and statistically significant. It increases from 1.41% to 1.85%, which corresponds to a 31% higher probability. Since adverse selection issues are limited by the participation rates during our observation window, we attribute the effect to moral hazard. In practice, this means that strategic divorces/separations have taken place, aiming at cancelling residual mortgage debt upon selling a house with negative home equity or facilitating a divorce by removing a potential financial burden. Moral hazard is also confirmed by the sizeable reunion rates that we find in the data: four to five years after a divorce during the financial crisis,

about 6% of couples were again cohabiting with the same partner as before the crisis and their divorce. This number is higher than in the pre-crisis period.

We have also investigated some indirect economic costs of divorce, looking at several life-cycle outcomes. These costs in terms of utility, welfare, or opportunity are associated with variables such as leisure or housing wealth (which drops, mostly for women), income (lowering for men due to alimony obligations), and retirement position (chance of working longer increases, mostly for women). Any institutional design that rewards separation is likely to trigger these negative outcomes.[9] Policymakers have several ways to deal with the reduction of mortgage-default insurance. Rather than allowing increased indebtedness, we suggest measures to reform the NHG.

1. Charging an actuarially fair premium, thus allowing competition in the mortgage insurance market, might improve the screening of customers and thus alleviate the problem of asymmetric information. This problem is, however, more relevant in case of adverse selection, which is not really an issue with NHG, so it would not necessarily alleviate moral hazard.
2. In combination with this measure, one could remove the NHG ceiling, thus pooling the entire population of mortgage holders. If the insurance premium is fair, this would not attract higher risks into the pool. At the same time, however, it is unclear what this would do in terms of general equilibrium. Consider, for instance, the fiscal effects.
3. Also, differentiating premiums by risk category (measured, for instance, by LTV and LTI ratios) may contribute to linking the choice for NHG to the insurance value of the product. In general, it would be obvious to set premiums in direct proportion to the expected risk.
4. Allowing a different payment frequency (periodic instead of lump sum) might avoid seeking extra debt and yet obtaining a similar participation rate. This option implies a restructure of the NHG funding system, which entails some costs.
5. The insurance scheme could be reconsidered. The idea of making this (semi-)public insurance dependent on a choice variable (such as divorce) can be revised, whereas reimbursements could include co-payments or deductibles, which are typically effective in alleviating moral hazard.

9 From a public finance point of view, increasing the debt ceiling for NHG buyers can have negative budgetary effects. The direct and immediate effects result from the higher cost of mortgage interest tax deductibility. According to the Ministry of the Interior, an LTV cap increase of 1 percentage point for NHG mortgages increases annually from €1 million in 2019 to structurally €25 million by 2049. These costs stem from the fact that the mortgage debt of this group will be 1% higher than the highest possible mortgage interest deduction. At present, the NHG premium is already a one-off tax-deductible item. As a result, homebuyers who opt for NHG will receive part of the premium back in the following year.

We believe that these five policy options are worth exploring, even if further reduction of the LTV cap in the future were to actually lead to lower NHG participation.

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Appendices

Appendix 1: Relevant marriage and divorce law

Being married is not essential in order to qualify for NHG. However, many persons who qualify for NHG are married. In the Netherlands the default marriage regime is community property, unless a couple explicitly chooses to sign a prenuptial agreement. Our data do not provide any information about the marriage regime, so we cannot determine how this would impact our analysis. The option to sign a prenuptial agreement is costly, however, as it requires a tailor-made contract that is signed in the presence of a notary before the marriage, and in some cases also the intervention of the court. So, for a couples who are not married and for couples who have a prenuptial agreement, the explicit costs of an uncontested separation/divorce typically only amount to relocation, if applicable. An uncontested divorce takes about three months for a married couple and can be arranged with a few meetings with a lawyer, the so-called mediator. In case of children or a partner who is not economically self-sufficient, alimony regulations are called for. In the former case, also a parental plan is needed, as joint custody is the rule. If the terms are contested, divorce can take up to two years.

Divorces/separations account for 3.3% of terminations of cohabitation.[10] Ten couples out of 1,000 are divorced, with the average age of a divorcee being 47 for men and 44 for women. Marriages lasted on average 14 years before divorce.

Appendix 2: Alimony regulations

Alimony has been regulated by law since 1971. The purpose of the Dutch alimony regulation is to maintain the living standards of prior to the divorce, whereas in other countries alimony is often meant to provide self-sufficiency. In the Netherlands, alimony is decided in court. The lawyer of each party sends a proposal to court. If only one proposal is received, this will normally be accepted.

Alimony is paid by the main income earner and received by the secondary income earner within the divided couple. Since 1994, the maximum duration for alimony payments is twelve years (currently this applies for a marriage involving children, while without children it is five years). In the case of children, child support must be paid until the child turns 18, or in special cases until he or she turns 20. The duration of alimony can be reduced if the marriage was shorter than five years. Payments stop when the receiver starts cohabiting again or dies. Payments can be reduced if the payer starts a new family, but all changes are decided in court. Alimony affects the income tax base. For the receiver it is taxable, for the payer it is deductible.

10 See https://opendata.cbs.nl/statline/#/CBS/nl/dataset/37556/table?ts=1526295428606

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