Residual Mortgage Debt Insurance and Defaults in the Netherlands

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In a nutshell

- **Aim:** evaluate effectiveness of residual mortgage insurance (Nationale Hypotheek Garantie - NHG) in increasing financial stability, using a microsimulation of the option to default
- **Research question:** Can mortgage insurance impact loan non-performance?
- **Answer:** Yes, the insurance helps lowering mortgage defaults and boosts financial stability.
- **But ...** there are signals of moral hazard
  - Separations increased among insured, and separated participants default more.
  - Insured borrower prepay less, even when they receive unexpected inheritances.
- **Conclusion**: NHG is valuable, but more efficient with sharper design.

Residual mortgage debt insurance?

- Managed by a fund (Stichting Waarborgfonds Eigen Woningen), that is government-backed, and takes on residual debt upon selling the house.
- Mortgage providers co-pay in case of loss of the fund.
- Only for borrowers who buy houses under a **varying price threshold**
- Eligibility: unemployment, separation, disability, death.
- Defaulting on loans is not a necessary condition for the insurance to pay out.
- Insured borrowers receive insurance & bottom interest rate. But:
  - They must amortize at least 50%
  - Respect LTI-cap
  - Fix interest rate for at least 10 years

Layout

- **Structural approach**: modeling default as an optimal decisions.
- **Microsimulation**: option value setting, where revealed preferences are assumed optimal and non-chosen alternatives must be simulated.
- **Validation**: quasi-natural experiment (RDD) of defaults based on institutional discontinuity at the insurance threshold.
- Study of separations and prepayments around the threshold, including inheritances.

Related Literature

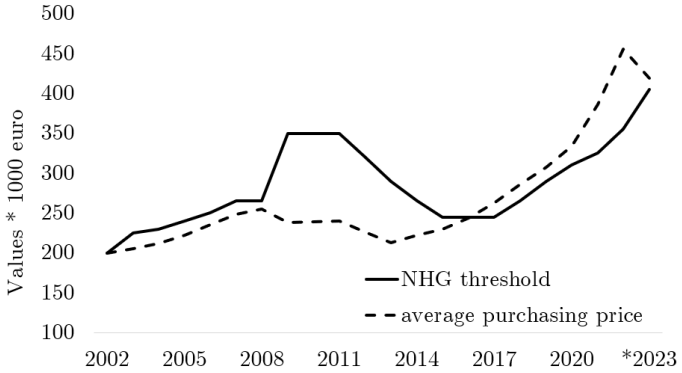
- **Mortgage Default**
  1. Liquidity Defaults
     - Mian and Sufi 2011, 2013, 2014.
     - Adelino, Schoar, and Severino 2016
  2. Strategic Default
     - Gerardi et al. 2018 Gerardi et al. 2013 - *can pay but wouldn't pay* - **very rare**
     - Guiso, Sapienza, and Zingales 2013, Riley 2013, Mayer et al. 2014 - *no recourse mortgages*
     - little evidence about NHG - Kim et al. 2022, Haan and Mastrogiacomo 2020
- **Optimal Stopping Model**
  - Foster and Van Order 1984, 1985
  - Campbell and Cocco 2015 - dynamic model of households' mortgage decisions
  - Hatchondo, Martinez, and Sánchez 2015 - Life-cycle model with house-price risk

Data

- **Loan-level-data** (LLD) collected by DNB. (2012-2018)
  - Credit-register type of data (with retrospective information (**11 years: 2007-2018**)
  - Unique information: account status, insurance, prepayments, plus 60 more loan and borrowers characteristics (LTV, LTI, origination, interest rate percentage ...)
- **Linked to admin data**, using pre-loading by tax office, by CBS:.
  - Registry data; household composition
  - Social security registry: current employment status
  - Tax data: income and wealth
  - Transfer data: inheritances
  - ... data collection requested a modification of Dutch law, **but ...**

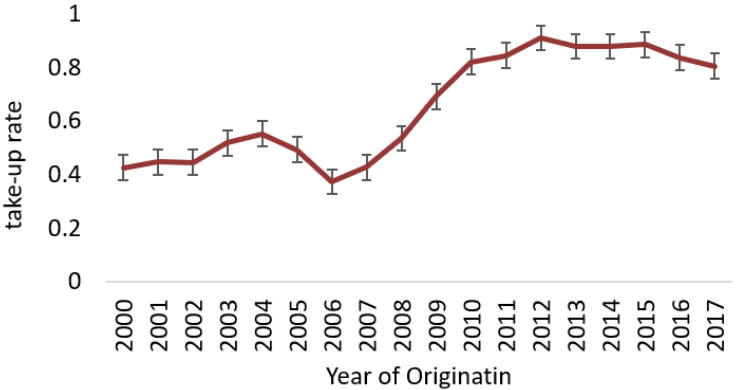
Descriptives 1: threshold and prices

- Threshold does not follow predictable pattern
- First slightly above average purchase prices
- Significantly surpassed average prices during crisis (almost all sold houses qualified)
- Eventually settled below prices



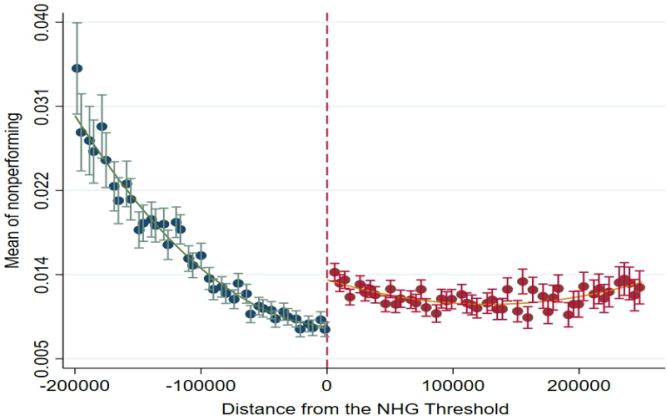
Descriptives 2: an offer one cannot refuse?

- During crisis take-up rate was almost 100%
- This implies little room for adverse selection in insurance.



Descriptives 3: defaults around the threshold

- Non-performance low by international standards
- Negative slope at the left of the threshold (effect of affordability?)
- Defaults jump up at the right of the threshold
- No slope at the right



DP vs Option Value Model

- DP: Default is a result of optimizing behaviour of the borrower.
  - Inter-temporal choice, optimal path to default within given period.
  - We do not observe all possible periods, so no further results presented here.
- Option value: at each period, borrower decides whether to pay their mortgage or default, considering the lifetime return of each action.
  - Defaulted borrower have to pay rent for ever, can exploit different fiscal facilities/subsidies that affect their gross-net trajectory.
  - otherwise, they make the same decision the following period.
- Model delivers the **marginal utility of present and future consumption**

Estimation results

	All	Age		Employment		Type of House		Location	
		≤ 35	>35	Employees	Others	Detached	Apartment	Randstad	Other
Consumption	2.853***	19.57***	1.108***	3.797***	0.695***	2.893***	2.886***	2.857***	2.944***
Home Equity	0.0174***	-0.170***	0.229***	-0.017***	1.100***	0.0649***	-0.0747***	-0.087***	0.0368***
Age	-0.001***	-0.491***	0.0173***	-0.024***	0.003***	-0.012***	-0.009***	-0.026***	-0.001***
NHG	3.906***	1.962***	4.650***	3.262***	9.194***	4.881***	1.593***	1.365***	4.310***
a	-21.57								
Observations	4 805 933	1 031 592	3 774 341	3 830 937	974 996	3 689 279	1 116 654	507 375	4 298 558

rental price

RDD basic set up

$$Y_{d_{it}} = \alpha + \beta_1 uw_{i,t} + \beta_2 NHG_i + \beta_3 NHG_i * uw_{i,t} + \upsilon$$

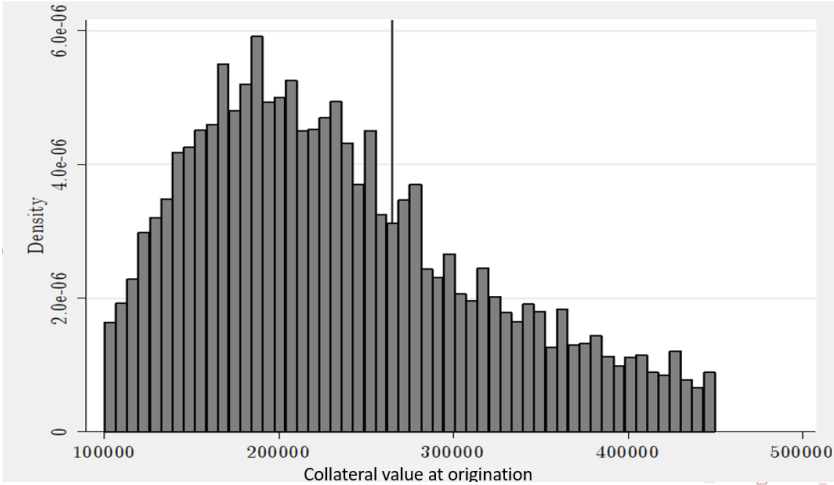
Where *NHG* = 1 indicates participation and *uw* = underwater status

NHG threshold qualifies as a sharp cutoff point (c) that allows assignment to treatment. The assignment variable is the value of the house at purchase h_{i1} and the treatment status implies that $NHG = 1[h_1 < c]$.

Two assumptions are relevant:

- treatment effect is constant (it does not differ by household),
- Continuity, s.t. unobservables υ imply that $E(\upsilon_i | h_{i1} = h_1)$ is continuous in h_1.

Smoothness around threshold (2014)



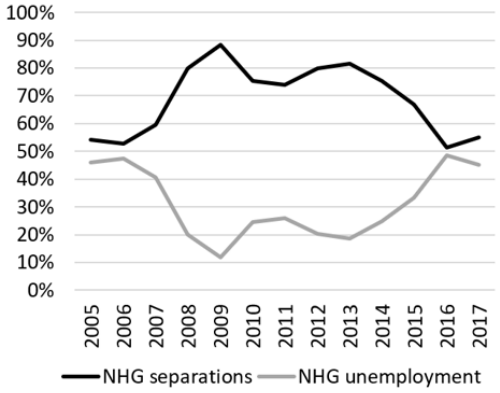
Effect (around the threshold)

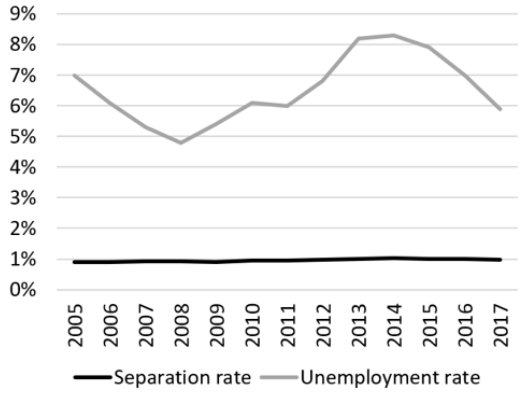
	All	Drop 5% tails	Drop 10% tails	Drop at threshold	Drop 5000 EUR from threshold
Underwater (β_1)	0.0355***	0.0351***	0.0351***	0.0355***	0.0353***
NHG (β_2)	-0.0005*	-0.0006**	-0.0009***	-0.0005*	-0.0004
NHG * underwater (β_3)	-0.0179***	-0.0211***	-0.0215***	-0.0178***	-0.0173***
Constant	0.0129***	0.0131***	0.0130***	0.0129***	0.0129***
Observations	1 594 766	1 261 260	1 120 874	1 569 792	1 522 232
R-squared	0.0090	0.0091	0.0094	0.0090	0.0089

robustness policy simulations

Qualification criteria

Honoured claims of NHG participants by qualification criteria (left), versus national separation and unemployment rate (right)





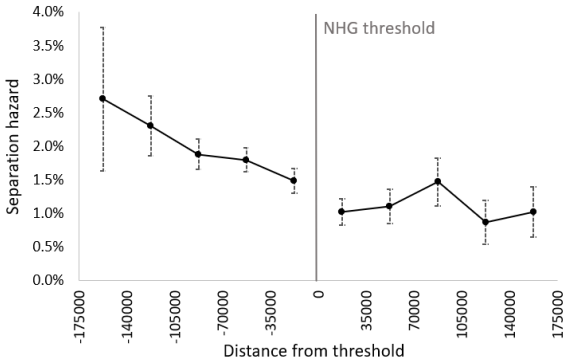
Augmented model

$$Y_{d_{it}} = \alpha + \beta_1 uw_{i,t} + \beta_2 NHG_i + \beta_3 NHG_i * uw_{i,t} +$$
$$\beta_4 separated + \beta_5 NHG * separated +$$
$$\beta_6 unemployed + \beta_7 NHG * unemployed + \delta X_{i,t} + \upsilon$$

- Separating is (partly) a choice within the household.
- Other criteria like disability, death, and unemployment are (usually) involuntary.
- If no effect of insurance, we would expect no significant difference in defaults between those separating or not with and without insurance.
- in X we also add risk triggers and other characteristics

Augmented model results

	2012-2018	
	Model A	Model B
Underwater (β1)	0.0293***	0.0223***
NHG (β2)	-0.0024***	-0.0056***
NHG * underwater (β3)	-0.0157***	-0.0140***
Separated (β4)	0.0042***	0.0003
Separated*NHG (β5)	0.0007*	0.0016***
Unemployed (β6)	0.0129***	0.0097***
Unemployed * NHG (β7)	0.0075***	0.0077***
Debt service to income ratio		0.0016***
Income (ihs)		-0.0099***
Assets (ihs)		-0.0027***
LTV at origination		0.0121***
Current age		-0.0006***
Self-employed at origination		0.0058***
Dummies for year of origination	yes	yes
Year of birth dummies	yes	yes
Constant	0.0278***	0.1737***
Observations	10,108,840	10,108,840
R-squared	0.0093	0.0128

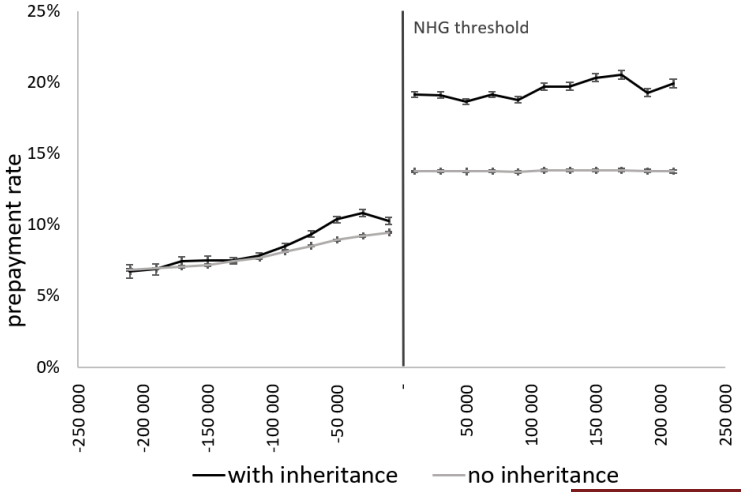


competing channels

Prepayments

- Prepayments can reduce potential residual debt
- NHG insured are less wealthy, lower prepayments only indicative near threshold?
- Inheritances could induce prepayments, but insured could be less likely to expect/receive one.
- ”Unexpected” inheritances should be less endogenous.
  - Inheritances & transfers micro data 2007-2018
  - All inheritances $>$ 6000 euro
- Prepayment rate = (cumulative prepayments) / (original debt)

Prepayment discontinuity



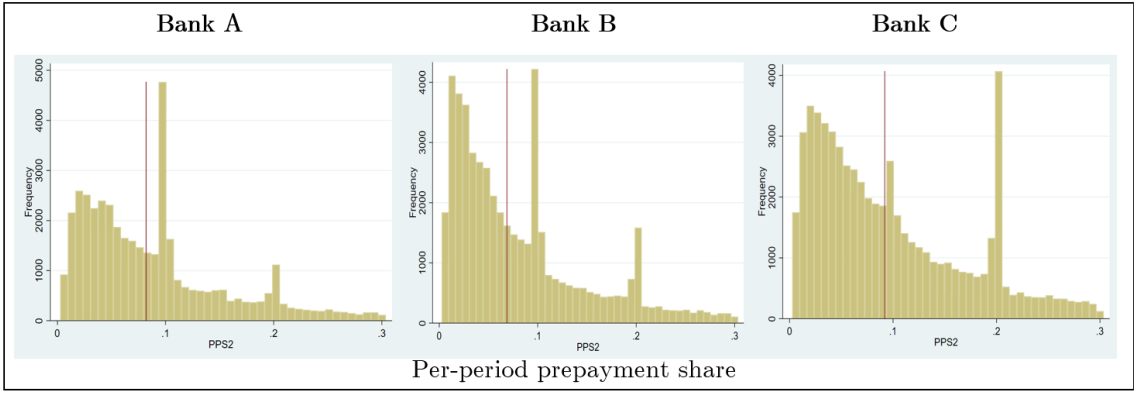
Prepayments: wrap up

- Progressive levels of exogeneity: inheritances, unexpected inheritances, NHG threshold.
- All checks reveal that NHG induces 3% lower prepayment rate
- Checks: inheritance vs gifts, age of unexpected death, bandwidth around and away from threshold. checks
- Specifications including bank dummies correct for prepayment fees. banks
- Conclusion: residual debt insurance induces borrowers to prepay less, and increases therefore their likelihood to be/stay underwater.

Conclusions

- NHG is a valuable tool to stabilize the housing market, as it sets higher lending standards and reduces defaults.
- Does the design need sharpening? Moral hazard could play a role:
  - in increasing separations
  - in disincentivizing prepayments
- Options:
  - Upfront: make premium depend on riskiness? or (draconically) remove separation from qualification criteria?
  - Ex-post: introduce co-payment? or conditionality on repayment capacity?
  - Do nothing: we accept a ”moderate” amount of moral hazard.
- During the crisis little role for adverse selection, but now participation is dropping: should we remove the threshold?

Prepayment share by bank



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Checks: prepayment rate

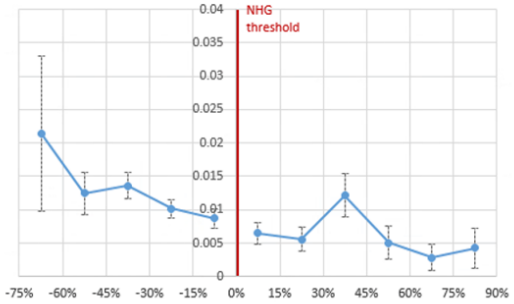
	Coefficient *NHG*	Coefficient *NHG × inheritance*	N		Coefficient *NHG*	Coefficient *NHG × inheritance*	N
Baseline Estimation(NHG × Inheritance)	-0.0285***	-0.0079***	656 159	Rich parents dummy × Inheritance	0.0099***	0.0018	390 279
NHG × Unexpected Inheritance:died before 70(65)	-0.0283***	-0.013***	597 795	Close to the threshold(± 200,000)	-0.0251***	-0.0097***	552 717
NHG × Unexpected Inheritance:died before 65(60)	-0.0283***	-0.018***	592 169	Loans that originate since 2007	-0.0279***	-0.0076***	433 998
NHG × Unexpected Inheritance:died before 75(70)	-0.0283***	-0.009***	604 966	Loans that originate since 2013	-0.0217***	-0.0051***	192 773
NHG × Transfer	-0.0285***	-0.0050***	656 159	Add amount inherited	-0.0286***	-0.0072***	656 159
NHG × Inheritance after buying houses	-0.0288***	-0.0048***	635 481	Add bank dummy	-0.0267***	-0.0085***	656 159
NHG × Gift	-0.0291***	-0.0004	656 159				

back

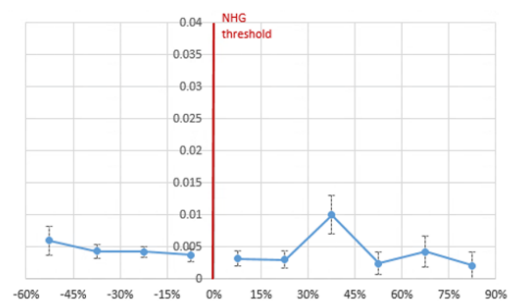
Competing qualification criteria

Unemployment and disability hazards do not show significant discontinuity at the threshold. back

Unemployment hazard



Disability hazard



Robustness and placebo check for model estimates (2014)

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Model	NHG*underwater (β3)
Baseline	-0.0141***
Robustness checks:	
Dropping 5% tail	-0.0170***
Dropping 10% tail	-0.0175***
Drop observation €5000 from threshold	-0.0134***
Drop observation €10000 from threshold	-0.0123***
Observations within €50000 from threshold	-0.0165***
Placebo tests:	
Treatment: income above €40000	0.0370***
Treatment: income above €60000	0.0130***
Treatment: fin. wealth above €50000	0.0041
Treatment: fin. wealth above €100000	0.0277***

Policy simulations for share of defaults based on 2014 data

back

	Predicted defaults	St. Dev.
Baseline model	2.04%	0.0183
NHG threshold increases by 10000 euro	1.86%	0.0183
NHG threshold increases by 50000 euro	1.80%	0.0182
NHG threshold increases by 100000 euro	1.76%	0.0182
LTI limit increases by 10%	2.19%	0.0181
LTI limit increases by 20%	2.23%	0.0185
LTI limit increases by 30%	2.47%	0.0189
LTV at origination increase by 10%	2.17%	0.0187
LTV at origination increase by 20%	2.31%	0.0192
LTV at origination increase by 30%	2.47%	0.0197

Sensitivity analysis: rental prices

In baseline model we assume that alternative rental price is 25% of gross income. This is very low by current market conditions, and corresponds to prudential DSTI share (NIBUD) for purchase. back

	Rent as a percentage of total household income					
	22%	25%	28%	30%	34%	38%
Consumption	-0.679***	2.853***	2.870***	3.723***	4.008***	3.218***
Home Equity	0.0170***	0.0174***	0.0165***	0.0204***	0.0231***	0.0259***
Age	0.0261***	-0.00988***	-0.00900***	-0.0251***	-0.0348***	-0.0261***
NHG	5.042***	3.906***	3.559***	3.235***	2.448***	2.032***