Borrowing constraints, housing tenure choice and buy-to-let investors: An assignment model

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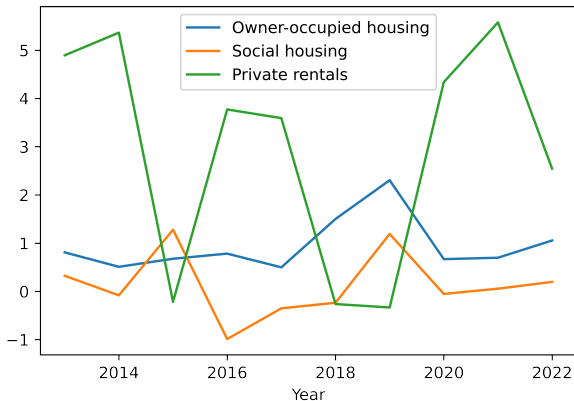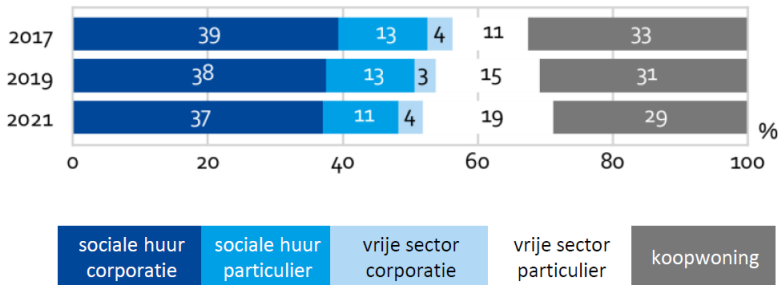# The revival of the Dutch private rental sector, 2012-2022

Figure: Annual growth rates, in %

Amsterdam housing stock, 2017-2021

Buy-to-let investment

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- What explains the rise in buy-to-let investment?

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- What explains the rise in buy-to-let investment?
- The Dutch policy debate suggests it is not a rise in the preference for renting: concerns that buy-to-let investors
    - compete with first-time buyers;
    - drive up house prices;
    - charge higher rents than owners would pay as user costs.
- First-time buyers complain that mortgage payment-to-income constraints drive them in the arms of buy-to-let investors.
    - Can the 2011 tightening of these borrowing constraints explain the revival of the Dutch private rental sector?

- Can mortgage payment-to-income constraints explain the rise of the private rental sector in an assignment model of the housing market?

We find that

- borrowing constraints open up an arbitrage opportunity for buy-to-let investors.
- buy-to let investors do drive up prices, and do charge higher rents than owners would pay as user costs.

This paper

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- borrowing constraints open up an arbitrage opportunity for buy-to-let investors.
- buy-to let investors do drive up prices, and do charge higher rents than owners would pay as user costs.

We also find that

- (homogeneous) borrowing constraints result in a Pareto-improvement for buyers at the expense of sellers.
    - heterogeneous borrowing constraints can increase utility for buyers with wealth at the expense of buyers without wealth;
    - apart from any macro-prudential costs and benefits.
- any utility gains are arbitraged away by buy-to-let investors.

A one-sided assignment model:

An owner-occupied housing market with passive sellers:

- Houses are durable, indivisible and heterogeneous in housing services, or quality, q: exogenous distribution $G(q)$;
- Buyers differ in their income y, with distribution $F(y)$.
  - y referred to as income, but represents the amount of money the buyer is willing to spend on consumption in the period under consideration;

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Who lives in which house, and at what price?

- Richest buyer lives in nicest house.
- Prices adjust to induce buyers with lower incomes to choose lower-quality houses.
- Price of q may thus vary over the housing distribution.

Equilibrium: a continuum of markets for housing with given quality.

- Population of buyers with identical preferences

$$u = u(q, c), \tag{1}$$

over normal goods q and other consumption c.

Buyers

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- Buyers maximize utility subject to the budget constraint

$$c + p(q) = y. \tag{2}$$

- $p(q)$ is user cost of housing ($\propto$ sales price of a house of quality q):
  - product of market value and opportunity cost of capital invested, plus costs of maintenance and taxes, minus expected appreciation.

Income of the marginal buyer

- The total number of buyers equals B, so that $B = F(y^{max})$.
- The total number of houses is S, so that $S = G(q^{max})$.
- Assume more buyers than owner-occupied houses: $B \geq S$.

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- Define critical income y^c by the condition that only S buyers can own a house:
$$B - F(y^c) = S.$$

Who lives where?

Lemma (Assignment rule)

In equilibrium, the assignment follows

$$y(q) = y^c + F^{-1}(G(q)). \tag{3}$$

- Ranking of buyers on basis of y corresponds to ranking of buyers on basis of q.
- User cost $p(q)$ not necessarily linear in housing services q:
  - Marginal price of housing $\pi(q) = \partial p / \partial q$ may depend on q.
- What is the equilibrium user cost function $p(q)$?

Equilibrium price function

Lemma

- *Buyers with critical income must be indifferent between lowest-quality housing and outside option:*

$$u(q^{min}, y^c - p(q^{min})) = u^*(y^c), \qquad (4)$$

  which pins down $p(q^{min})$ as an initial condition.

- *Slope of the price function, $\pi(q) = \partial p / \partial q$, must equal the marginal rate of substitution $M(q, c) = (\partial u / \partial q)/(\partial u / \partial c)$:*

$$\pi(q) = M(q, y(q) - p(q)), \qquad (5)$$

  where $y(q)$ follows from the assignment rule.

Mortgage-payment to income constraint

- Now interpret y as income only.
    - Later, buyers may differ in wealth: heterogeneous constraints.
- Borrowing constraint: the user cost can at most be equal to a fraction μ of income:
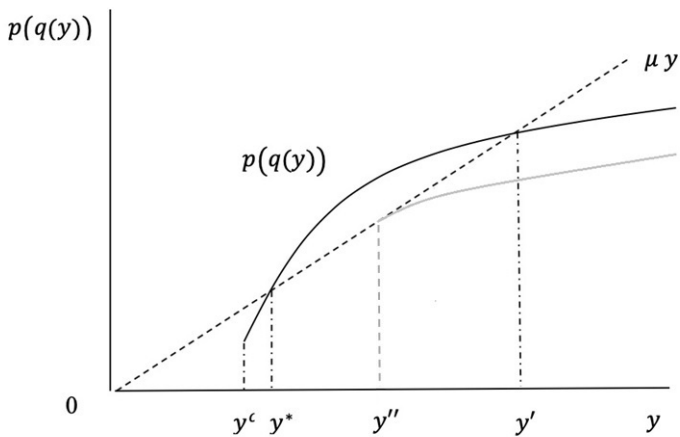$$p(q) \leq \mu y. \tag{6}$$

- Now it is useful to think of prices as a function of income: $p(q(y))$ with
$$\frac{\partial p}{\partial q}\frac{\partial q}{\partial y} = M(q(y), y - p(y))\frac{f(y)}{g(q(y))}$$
where $q(y)$ follows from the (inverse of the) assignment rule.

Example of borrowing constraints

Impact of borrowing constraints

Proposition

Consider the introduction of a borrowing constraint that starts to bind at $y^* > y^c$. Define y'' as the smallest $y \geq y^*$ for which in the right-sided neighborhood of y'', $M(q(y), (1 - \mu)y)f(y)/g(q(y)) < \mu$ if that occurs, and as y^{max} otherwise. Then,

- *The assignment rule does not change;*
- *Prices are the same for $[y^c, y^*]$ and strictly lower for $(y^*, y^{max}]$: utility is higher for all buyers with $y > y^*$;*
- *Prices for $[y^*, y'']$ are given by μy;*
- *Prices for $y > y''$ are strictly lower than μy, unless the borrowing constraint starts to bind again.*
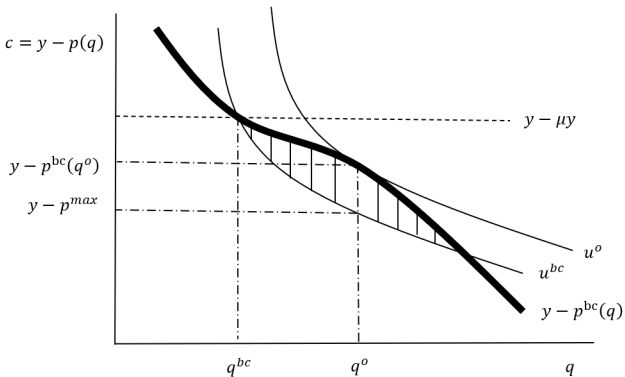
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Borrowing constraints are Pareto-improving for buyers, but buyers' marginal willingness to pay may exceed the marginal price.

- 'Naive' buyers would like them to be relaxed.

Marginal willingness to pay exceeds the marginal price

Heterogeneous borrowing constraints

- Suppose that for each income level y, buyers may face different μ.
- Some buyers with y may be constrained, while others may not.
  - Constrained buyers will generally consume less housing than unconstrained buyers with the same income level.
  - Constrained buyers free up houses higher up in the distribution.

Heterogeneous borrowing constraints

- Suppose that for each income level y, buyers may face different μ.
- Some buyers with y may be constrained, while others may not.
  - Constrained buyers will generally consume less housing than unconstrained buyers with the same income level.
  - Constrained buyers free up houses higher up in the distribution.

- Constrained buyers may even be pushed out of the housing market, with lower-income buyers being able to enter.
  - If y^c is lower, then $p(q^{min})$ will be lower.
- If borrowing constraints are binding at prices below $p(q)$, then income of unconstrained buyers at q is lower
  - Lower income at q implies lower marginal willingness to pay, so lower marginal price.
- Prices will generally be lower than in the unconstrained equilibrium.
- Utility of unconstrained buyers increases, but impact on constrained buyers is ambiguous.

Buy-to-let investors

- Buy-to-let investors have no borrowing constraints;
- Constrained buyers have a marginal willingness to pay that exceeds the marginal price.
- Arbitrage opportunity: investors can buy houses in constrained segments and let them to constrained buyers at a rent $r(q)$ that exceeds $p(q)$.
- We assume
    - utility only depends on q and c, not on tenure type;
    - investors are active as long as $r(q) > p(q)$ for some q.

# An equilibrium with buy-to-let investment

Proposition

- *Prices are the same as without borrowing constraints;*
  - *Rents replace mortgage payments for constrained buyers;*
- *The assignment is the same as without borrowing constraints;*
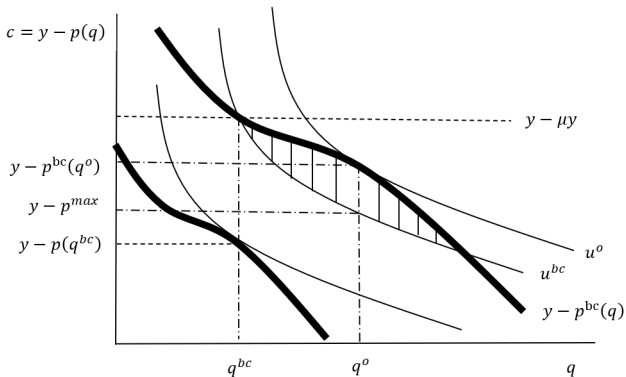- *The utility gains for buyers have disappeared.*

The effects of borrowing constraints with buy-to-let investment are

- an increase in the size of the private rental sector.
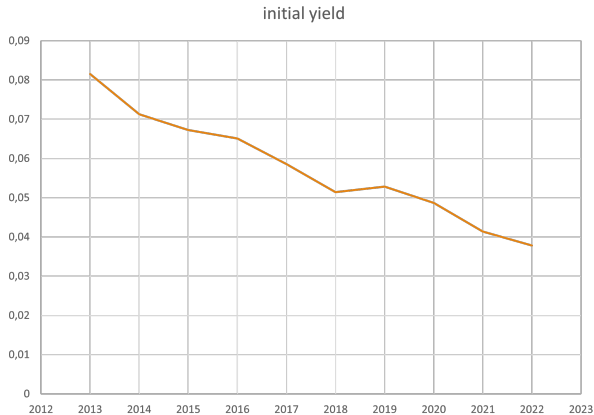- the macro-prudential benefits, if any.

Borrowing constraints create arbitrage opportunity
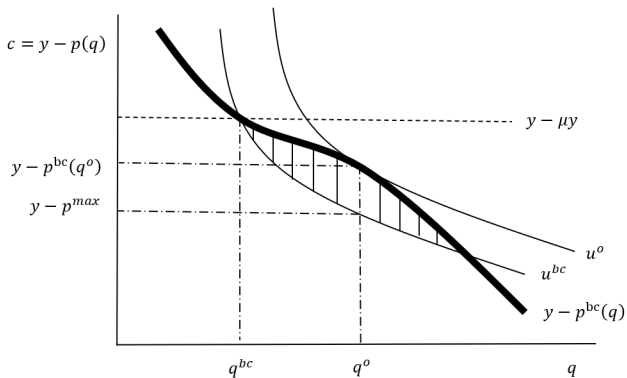
Borrowing constraints create arbitrage opportunity

Initial yield when both sales price and rent is known for the same house (N=2498)

initial yield

Conclusion

- Borrowing constraints reduce prices.
- Homogeneous borrowing constraints are Pareto-improving for buyers.
    - Wealthy buyers benefit from borrowing constraints, but less wealthy may suffer.
- Borrowing constraints create profit opportunities for buy-to-let investors.
- Buy-to-let investors arbitrage away most effects of borrowing constraints, but
    - create a larger private rental sector,
    - may or may not be better able to bear price risk.

- Other extensions (soon) in the paper:
    - Orthogonal preference heterogeneity;
    - Partial entry by buy-to-let investors;
    - Mobility across markets/cities.