Rouwendal, Jan; Alessie, Rob

Working Paper

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Tinbergen Institute Discussion Paper, No. 02-074/3

Provided in Cooperation with:
Tinbergen Institute, Amsterdam and Rotterdam

Suggested Citation: Rouwendal, Jan; Alessie, Rob (2002) : House Prices, Second Mortgages and Household Savings; An Empirical Investigation for the Netherlands, 1987-1994, Tinbergen Institute Discussion Paper, No. 02-074/3, Tinbergen Institute, Amsterdam and Rotterdam

This Version is available at:
https://hdl.handle.net/10419/86032

TI 2002-074/3
Tinbergen Institute Discussion Paper

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Jan Rouwendal[1,2]
Rob Alessie[2]

[1] *Wageningen University,*
[2] *Vrije Universiteit Amsterdam, and Tinbergen Institute.*

Tinbergen Institute
The Tinbergen Institute is the institute for economic research of the Erasmus Universiteit Rotterdam, Universiteit van Amsterdam and Vrije Universiteit Amsterdam.

Tinbergen Institute Amsterdam
Keizersgracht 482
1017 EG Amsterdam
The Netherlands
Tel.: +31.(0)20.5513500
Fax: +31.(0)20.5513555

Tinbergen Institute Rotterdam
Burg. Oudlaan 50
3062 PA Rotterdam
The Netherlands
Tel.: +31.(0)10.4088900
Fax: +31.(0)10.4089031

House Prices, Second Mortgages and Household Savings
An empirical investigation for the Netherlands, 1987-1994

Jan Rouwendal[1,2,3] **en Rob Alessie**[* 2,3]

[1] Wageningen University
[2] Free University of Amsterdam
[3] Tinbergen Institute

This version: June 20, 2002

Keywords: House Prices, Mortgages, Savings, Consumption, Panel Data
JEL Classification Codes: E21, G21, R31

Abstract
Since the beginnings of the eighties house prices in the Netherlands have increased steadily and considerably. In this paper we study the effect of this development on the demand for second mortgages and on the savings of Dutch households. We use the data of the Dutch socio-economic panel for the years 1987-1994. These data contain self-reported values of the houses of owner- occupiers, which are shown to correspond to the median sales prices provided by the Dutch Association of Realtors. Households therefore seem to be well aware of the increase in the value of their house. We use panel data methods to investigate the effect of house prices on (i) the number and size of second mortgages, (ii) the savings of owner-occupiers and (iii) the savings of renters that may be considered as would-be owners. We find a significant effect of home equity on the demand for second mortgages. Savings of homeowners decrease when house prices accelerate. We find no evidence that increased demand for mortgage loans is caused by substitution from other forms of consumer credit. Contrary to results reported in the literature, we find no evidence of an increase in savings of would-be owners caused by higher house prices.

Corresponding author: Jan Rouwendal, Department of Economics, Free University, De Boelelaan 1105, 1081 HV Amsterdam, The Netherlands, tel 31-20-4446093, fax 31-20-4446004, email jrouwendal@feweb.vu.nl. In this research data have been used from the Socio Economics Panel of Statistics Netherlands (CBS), which have been made available through the Scientific Statistical Agency.

* This project started when Alessie was at Tilburg University.

"*It is now recognized that the increases in housing wealth which took place in the 1980s contributed significantly to the consumer boom of the 1980s. Indeed, that none of the major econometric models of the United Kingdom incorporated housing wealth in their consumption function at that time, was a major reason for the failure to forecast consumer expenditure which led to costly errors in macroeconomic policy"*

Muellbauer and Murphy (1997), p. 1701

"..Federal Reserve chairman Alan Greenspan [has stated] that the marginal propensity to consume out of real estate wealth is about 5 percent. This somewhat inscrutable, and unsupported, claim seems awfully hard to accept, given what we know about the basic economics of housing markets. Indeed, I take the view that changes in real estate prices (holding the stock of housing constant) have basically no effect on aggregate wealth. As such this entire discussion seems a little silly."

Glaeser (2000) p. 147

1 Introduction

House prices are quite volatile and booms and busts on the housing market seems to occur in all western countries (see, for instance, Poterba, 1991 en Roehner, 1999). Since housing equity is the most important component of household wealth, changes in housing prices might well have substantial effects on consumption and saving behavior. It has indeed been argued that increases in house prices have contributed substantially to the decline in US savings (Bosworth et al.,1991), to the consumption boom in the United Kingdom in the late eighties (Muellbauer and Murphy, 1990) and to a similar boom in the Netherlands during the nineties (Central Planning Bureau,1999, Dutch National Bank, 2000). At first sight, these assertions might appear to be almost self-evident. Homeowners get richer if the value of their property increases and are therefore able to consume more. Nevertheless, there has been considerable debate in the literature about the magnitude, and even about the sign of the effect of an increase in house prices on consumption and savings.

The *prima facie* evidence for a relation between house prices and consumption is the correlation between these two at the macro level. However, it has been pointed out repeatedly in the literature that this correlation might well be due to the fact that both phenomena have the same cause. If the economic climate improves, consumption goes up, with housing demand as one of its components. Inelastic supply of housing causes house prices to increase. The result is a correlation between the two that is independent of any causal effect of house prices on consumption (cf. King, 1990, Pagano, 1990, Miles, 1994, pp 4-7.)

In order to measure the 'pure' effect of house prices on consumption and savings, it is therefore necessary to isolate it from other effects on consumption much as possible. Micro data offer some possibilities for doing so. For instance, not all houses appreciate at the same rate and one would expect that households who experience a large increase in housing equity will (all else equal) show a more substantial reaction to increases in house prices than others. At the level of individual households, one may control for effects of education, income and other indicators of permanent income that may be correlated with homeownership and see if any effect of a house price increase remains after doing so.

The micro-econometric approach to this question has been used earlier (see the literature survey below) but mostly for US and UK data and with mixed results. In this paper we report the results of three analyses that refer to the Dutch situation. First, we investigate the relation between home equity and the demand for second mortgages. It has been argued repeatedly that second mortgages are an important channel through which the effects of higher house prices on consumption flows. However, to the best of our knowledge, no empirical studies that support such claims exist. Second, we analyze the savings of owner-occupiers in order to find out if those experiencing high capital gains due to housing appreciation reduce savings relative to others. Third, we investigate if renters that can be reasonably qualified as would-be homeowners save more if house prices increase. Such increased savings might compensate partly or completely for the decreased savings of homeowners and make the net effect of house price increases on total consumption expenditure zero, or even negative. In al three investigations we use data from the Dutch socio-economic panel (SEP). The results we find are in some respects markedly different from those reported earlier in the literature.
The paper is organized as follows. Section 2 provides a brief survey of some relevant literature. Section 3 discusses the Dutch housing market and the Socio-Economic Panel. In section 4 we start the analysis with a study of the demand for second mortgages. In section 5 we consider savings of owner-occupiers and renters. Section 6 concludes.

2 The relation between house prices and consumption

At first sight, the life cycle model of savings and consumption seems to provide an easy underpinning for a positive effect of house price increases on consumption. Higher house prices imply wealthier owner-occupiers who may therefore be inclined to spend more money. However, housing is not only an asset, but also a (durable) consumption good and it is unlikely that changes in the price of such a good have major effects on the economy as a whole. For instance, Skinner (1989) states:

> *Any relative price increase implies that some gain (those selling the good), while others lose (those buying the good); usually these effects wash out across the economy as a whole. That is, the positive wealth gain of the homeowners could be exactly offset by the wealth loss of younger consumers saving for their dream home.' (p. 306)*

Skinner admits that there is an exception to this rule: when the increase in house prices is (perceived to be) permanent, the current homeowner can capture some of the future rent on the asset when it is sold to future generations. He elaborates this conclusion by means of a simulation model in which 'any housing price increase causes a substantial short run decline in aggregate saving rates as homeowners spend down their windfall gains' when bequests are ruled out (p 306). When a strong bequest motive is present, this effect disappears.
He then used the Panel Study of Income Dynamics (PSID) in order to study the relation between house prices and consumption empirically. Household consumption, which is absent in these data, is computed on the basis of an equation that relates it to food expenditures, auto ownership and utility payments, which are reported in the PSID. After

controlling for individual (fixed) effects, Skinner could not find a significant effect of housing appreciation on the consumption of owner-occupiers.
Hoynes and McFadden (1994) also use the PSID, but concentrate on savings as measured by the changes in non-housing wealth over a period of five years. They find no effect of changes in house prices. As a possible explanation for their findings they suggest that households make savings decisions independent from expectations with respect to housing wealth (e.g. because of saving through paying premiums for pensions and other life insurance, or because of some form of mental accounting, see Thaler, 1985). Alternatively, they discuss the possibility that households make naïve expectations with respect to the value of their houses that does not reflect all available information. The validity of the latter explanation can be investigated by a comparison of self-reported house values with sales prices.
Engelhardt (1996) also uses the PSID and concentrates on the relationship between house prices and the savings of owner-occupiers. He argues that increases in housing wealth should be unanticipated and permanent in order to have an effect on consumption and savings. He computes two measures of household savings by taking differences of wealth components. The first, active savings, concerns the portion of income that is not consumed but used to purchase assets. The second, passive savings, simply measures the changes in non-housing wealth. It also includes capital gains on existing assets in the household portfolio, which usually are not thought of as income. The motivation for making this distinction is presumably the hypothesis that active saving is the result of deliberate actions of the households, whereas passive saving contains windfall gains and losses. Regression results suggest that housing capital gains have a negative effect on active saving when OLS is used. However, the coefficient that measures this effect becomes insignificant if the data are trimmed in order to remove outliers. When median regression is used, a small but significant effect is found. Further analysis reveals that this effect is caused only by negative housing capital gains and this suggests an asymmetry in the reaction of homeowners to increased house prices. Engelhardt uses a number of other variables in his regressions in order to control for heterogeneity, but does not control for individual effects by means of an error component model.
One possible reason for the difficulty of finding a response to higher house prices may be that consumers are not always able to cash the capital gains on housing. Households that experience credit constraints may simply be unable to decrease their saving. Such credit constraints become less important if households are allowed tot take a second mortgage (or switch to a higher mortgage loan) if the value of their house increases. Indeed, Muellbauer and Murphy (1990) stress the importance of households being able to cash their capital gains for their conclusions.
For the US, second mortgages have become popular during the 1980's. Manchester and Poterba (1989) document this development and show that households with second mortgages are on average less wealthy than other owner-occupiers. The cross sectional information that they use does not allow for a causal interpretation, but is clearly consistent with the view that increased access to second mortgages (no matter whether this is due to financial innovation, relaxed credit constraints or higher house prices) reduces the savings of homeowners.
The empirical work reported in the papers just mentioned refers exclusively to owner-occupiers, but it must be noted that the future generations of homeowners to which

Skinner refers include a possibly large number of current renters. These households usually have to save in order to be able to meet down payment or mortgage qualification constraints when buying a house. Increasing house prices may induce them to save more. The positive effect of house price increases on the consumption of owner-occupiers may therefore be compensated partly or completely by a negative effect on the consumption of would-be owner-occupiers.

Engelhardt (1994) investigated the empirical importance of this second effect for the Canadian situation and finds that high house prices reduce the probability that renting households who participate in a tax deferred savings program report to be saving for a down payment. Sheiner (1995) uses data from the 1984 PSID to show that there is a positive cross section relation between house prices and accumulated wealth (liquid worth) of young renters and argues that this stems from the need to save more in order to meet the down payment ratio. Since the existing literature shows that a negative effect of house prices on the savings of homeowners is small or absent, she argues that the total impact of house prices on savings may well be positive. It should be noted that our empirical work refers to the Netherlands and that the relevant credit constraint there is a mortgage qualification constraint, not a down payment constraint. This may lead to different saving behavior by renters. Hochguertel and Van Soest (2001) find no support for the view that Dutch households accumulate financial wealth before acquiring a house and relate this to the absence of down payment constraints.

House prices also play a role in Attanasio and Weber's (1994) study of the UK consumption boom. They use the Family Expenditure Survey, which provides a long series of repeated cross sections of consumer expenditure. Attanasio and Weber stress the possible importance of the better economic prospects of the British economy as an explanation for both the increased consumption and the rising house prices and attempt to isolate the affects of rising housing prices *per se* from those of the better economic prospects in general. The difference between house price increases in various parts of the United Kingdom and the larger share of homeowners among older cohorts allows them to test the relative importance of house prices. They conclude that the increase in house prices explains part of the surge in consumption for some cohorts, in particular the older ones.

Finally, we note that Stein (1995) has stressed still another effect of increasing house prices. He considers a household that has bought a home after saving just enough to meet a down payment constraint. If the value of the house increases, selling the house implies that the capital gains become available for the down payment of the next house, allowing the household to trade up. Lamont and Stein (1999) provide some empirical evidence in favor of this phenomenon. For the purpose of the present study we note that a larger mortgage loan is associated with this trading up. This should be expected to imply higher payments for mortgage rent, making the net effect of this reaction to increasing housing prices on non-housing consumption probably negative. It has recently been argued by Ortalo-Magné and Rady (2001) that similar effects should be expected on a market without such a constraint.

Summarizing, it may be said that it has been difficult to find clear empirical evidence of a negative effect of housing appreciation on the savings of owner-occupiers in micro-data.[1]

[1] This stands in sharp contrast with the relatively large effects found in aggregate data, see e.g. Case, Quigley and Shiller (2001)

The effect of house price increases on the savings of homeowners seems hard to measure and is probably small. There are several possible reasons for this effect. One is the existence of substantial measurement errors in the computed figures for consumption and savings which make the data too noisy to find reliable estimates. An alternative possibility is that credit constraints are imposed on homeowners who attempt to cash their wealth increase. The natural way to investigate this issue would be to develop and estimate a structural model of the demand for second mortgages. This would allow one to analyze the effect of house price increases have on the frequency of second mortgages. On the other hand, it is somewhat surprising that the two articles that study the effect of increasing house prices on the savings of young renters find such relatively clear and substantial effects. It may be noted that neither of these uses the longitudinal data that produced the substantially different results on the savings of owner-occupiers. It seems desirable to study the relationship between house prices and the savings of renters also on the basis of such data.
In the following sections we attempt to fill these gaps by studying the demand for second mortgages and the effect of increasing house prices on the savings of both owner-occupiers and renters on the basis of panel data.

3 The Dutch housing market and the Socio-Economic Panel

In this paper we reconsider the effect of house prices on the savings by using the Dutch Socio-Economic Panel (SEP) for the period 1987-1994. This database contains information about income and wealth including the value of the house and the mortgage.[2] It allows us to study the developments of house prices and savings for individual households. Below we first give some general information on the development of the Dutch housing market since 1985. We compare this with the figures in the database we use and go on to discuss some other relevant features of the data.

Development of the Dutch housing market

Table 1 gives an impression of the development of house prices in the Netherlands during the second half of the eighties and the nineties. The figures listed there are median prices of sold houses as they are published by the Dutch Association of Realtors (abbreviated in Dutch as NVM). Price increases in the eighties were moderate, in the 0-5% range. In the nineties the increases were usually higher. In 13 years the median price of sold houses in the Netherlands has more than doubled.
A number of structural determinants of the increase in the Dutch house prices since the early eighties can be listed:

- A low starting point. The Dutch housing market experienced large price increases during the seventies, but in 1979 this episode came to a sudden end and prices virtually collapsed.[3] House prices remained at a low level in the early eighties when the housing market recovered gradually from this huge shock. As a consequence, prices were still at a low level in 1985.
- Rising real rents have been the result of the government's desire to limit subsidies to housing construction. In the presence of rent control, such subsidies were necessary in

[2] See Alessie and Kapteyn (1999) and Alessie, Hochguertel and Van Soest (1999) for more detailed information about the SEP.
[3] Cf. the striking picture of the development of Dutch house prices contained in Poterba (1991)

Table 1 Development of house prices and mortgage interest rate in the Netherlands

Year	*Median House Price (* 1000 Dfl)*	*% increase*	*Mortgage interest rate*
1985	130		7.8
1986	136	4.6	7.0
1987	141	3.7	7.0
1988	147	4.2	6.9
1989	155	5.4	7.6
1990	159	2.6	8.8
1991	164	3.1	9.3
1992	178	8.5	8.8
1993	198	11.2	7.5
1994	215	8.6	7.3
1995	223	3.7	7.1
1996	249	11.7	6.3
1997	271	8.8	5.8

Source: NVM (house price), CBS (mortgage interest rate).

order to allow the owners of rental housing (usually non-profit organizations) to break even. This policy has been successful in that most of these subsidies were abandoned in the nineties. However, the flipside of the coin was that real rents increased over the period 1985-1995 until the level required for breaking even was reached. As a consequence, preferences for owning became stronger.[4]

- The much lower level of inflation in the eighties was followed by a gradual decrease in interest rates for mortgage loans, a temporary increase in the beginning of the nineties notwithstanding. The relevant credit constraint in the Netherlands is a mortgage qualification constraint referring to the ratio between mortgage payments and income. Under such a constraint a decrease in the mortgage interest rate implies that larger amounts of money can be borrowed. This has probably pushed up demand.
- In the beginning of the nineties credit constraints for two earner households were relaxed substantially. The mortgage qualification constraint used to refer to the income of the breadwinner. However, when dual-earner households became more common and mothers of young children kept their jobs in larger numbers than before, the rationale for this rule disappeared. Nowadays, the relevant part of household income is simply household income itself, i.e. the sum of the incomes of husband and wife.
- The response of housing supply to increased demand is slow. As a result of physical planning there are long procedures involved in the construction of new dwellings. Moreover physical planning aims at concentration of housing construction in relatively high densities at locations that are accessible by public transport, in order to mitigate the growth of automobile traffic. However, it takes even longer to prepare these locations for the construction of new houses than others. As a result, the higher prices have only induced a weak response from the supply side. This is especially true

[4] See e.g. Salet (1999) for an overview of the recent developments of Dutch housing market policy.

for the popular (semi-)detached dwellings with a garden and prices in this part of the market have accordingly increased most.
- Prolonged economic growth (the recession in the early nineties was relatively mild in the Netherlands) has no doubt contributed to the higher level of demand for owner-occupied housing.

Relationship with self reported house values

An elementary question we have to answer when studying the effects of house price increases on savings is whether homeowners are aware of any changes in the value of their property.[5] Most homeowners do not consider selling their property in any given period, and they may simply not be aware that they have become wealthier. If this would be the case, no effect of changing house prices on savings or consumption *per se* is present, although the developments of all these variables might still be correlated with the business cycle. Since the SEP contains self-reported house prices for each owner-occupying respondent, the validity of this elementary requirement for house prices to have an effect on savings at all is easy to verify by comparing the figures published by the NVM, which have been listed in Table 1, with the analogous series derived from the SEP.

Table 2 shows the median self-reported house prices of SEP respondents for the years 1987-1994. It is clear from these figures that the homeowners perceive large increases in the value of their property. It must be noted that the median values computed from the SEP are sensitive to 'spikes' in the data, which are the result of clustering of the self reported values at multiples of 5.000, 10.000 or even 50.000 Dutch guilders. For this reason, we will later on in this paper work with average values. We use the median in Table 2 in order to be able to make a comparison with the NVM-series, which refers to median values.

The NVM figures (which are reproduced from Table 1) are shown in the last column of Table 2. The median value of the SEP-data in 1987 is 135,000, 6,000 lower than the corresponding figure provided by the NVM. In 1994 the SEP-median is equal to 200,000, which is 15,000 lower than the corresponding NVM-figure. The increase in the median price of sold houses given by NVM over these years is 52%, whereas the median house values given computed from the SEP-data increase by 48%. Although the levels are different, the development of both series is in close agreement.

As mentioned above, the NVM figures are based only on transaction prices, whereas SEP figures refer to the whole housing stock. Systematic differences between the values of houses in both sets will be reflected in the medians if homeowners have the right perceptions of the values of their house. Among sold houses, newly constructed houses are over-represented. Since the quality of such units is in general higher than the average quality of houses in the stock, this will tend to make the NVM figures systematically higher than those derived from the SEP data. This may explain the difference between the level of both series.

In order to get some insight into the validity of this conjecture, we have also computed median house prices for owner- occupiers who recently moved to their current house. Recently moved means here: during the year before the SEP-interview took place. The

[5] Hoynes and McFadden (1994) suggest that unawareness of increases in house values as a possible explanation for the absence of an effect of house prices on consumption in their data.

Table 2 Development of median house prices in the Netherlands

Year	*SEP (all owner-occupiers)*	*N*	*SEP (recent movers)*	*N*	*NVM*
1987	135	1869	140	113	141
1988	140	1876	150	150	147
1989	150	2066	150	136	155
1990	150	1954	165	149	159
1991	150	1854	165	114	164
1992	160	1919	160	99	178
1993	180	1961	190	132	198
1994	200	2035	208	114	215

Source: SEP, NVM.

figures presented in Table 2 confirm that the median self-reported house prices of recent movers is usually closer to the NVM figures.
Alternative explanations of the small discrepancy between the NVM figures and the self reported values are that information about increasing house prices reaches homeowners who do not consider selling their house with some delay, or that higher income households are somewhat underrepresented in the SEP (see Alessie and Zandvliet, 1993). Since high incomes are correlated with high house values, this will also tend to lower the SEP-figures in comparison to the NVM figures.
Differences between transaction prices and self-reported house values have been reported in the literature. For instance, Goodman and Ittner (1992) find that American homeowners overestimate the value of their houses by, on average, 6%. All in all, we interpret our comparison of NVM and SEP figures as tending to confirm the finding of DiPasquale and Somerville (1995) that transaction prices and owner reported values have quite similar time series patterns, although the price levels differ somewhat. We may conclude that Dutch homeowners perceived large increases in the value of their houses during the period 1987-1994, which appear to be closely related to the increases in the prices of sold houses. If we don't find an effect of changing house prices on savings, this is certainly not because homeowners are unaware of these changes.

Development of income and wealth
In the literature about the relationship between housing prices and savings the latter have usually been measured as the difference in wealth. Various definitions of wealth have been used for this purpose. On the one hand the difference between total wealth (including housing and durable consumption goods) in subsequent years has been used, for instance by Hoynes and McFadden (1994). Engelhardt (1996) refers to this measure as 'passive savings' since some of its components might change in value without any action of the household and even without the household being aware of it. Engelhardt himself defines a measure of 'active savings,' which include only the components of wealth that can be expected to change in value especially by the actions of the household. His measure includes the value of some durable goods, notably cars.
For the purposes of this paper it is useful to define a measure of savings that can be regarded as complementary to consumption. Since we have to estimate savings as the difference in wealth, our definition of wealth is crucial for that of savings.

The first thing to mention is that we exclude housing from our concept of wealth. This means that we will not investigate the hypothesis that house prices do not influence changes in total wealth, at least not directly. We will concentrate on the influence of house prices on a restricted definition of wealth, and a completely offsetting effect of changes in house prices on the development of this wealth concept will provide an indication for the validity of this 'neutrality' hypothesis.
In our concept of wealth we do not include the values of durables (the value cars and of jewelry and antiques are reported in the SEP). If higher house prices would induce some households to drive a more expensive car, we do not want to interpret this as part of their savings. Even though we admit that buying jewelry and antiques and possibly also cars and other durables can be interpreted (at least partly) as an investment, we interpret a positive effect of higher house prices on such investments not primarily as an increase in savings, but as an effect on consumption.[6]
We also exclude other real estate from our definition of wealth. Few respondents indicate a positive value for this wealth component. On the other hand, we include investments in stocks and bonds in our savings measure. Since stock and bond portfolios are often actively controlled, it seems appropriate to define net wealth in such a way that changes in these wealth components are included in a measure of active savings. Another reason for doing this is that we want to be sure that we do not measure an effect of increased stock prices on savings. Stock prices are correlated with house prices over the period under study. If we would exclude stocks and bonds from our wealth measure, it might be argued that what we measure is partly or completely an effect of increasing stock prices on consumption.[7]
Pension wealth and life insurance are not observed as part of discretionary wealth in the SEP and are therefore excluded from our definition of wealth. In Holland combinations

Table 3 Development of disposable income, net wealth and home-ownership

Year	Average Disposable Income	Average Net Wealth	% Owner- Occupiers
1987	36,441	21,030	43.9
1988	37,991	15,438	43.5
1989	38,726	20,734	45.1
1990	40,920	19,475	44.5
1991	43,808	23,514	45.1
1992	43,086	23,383	44.8
1993	42,222	24,317	47.0
1994	41,446	28,952	47.9

Legend. Income and wealth figures refer to current values.

[6] The doubtful accuracy of the jewelry and antiques component of wealth in SEP might in any case have been a reason for its exclusion.
[7] One might, alternatively, argue that changes in the values of stocks and bonds should be regarded as passive savings. However, it would be difficult to correct for the possible effects of these changes on savings since stocks and bonds are different from housing in an important respect: households can sell and buy stocks frequently and at low costs, whereas it is much more difficult to move house. Since many people who own stocks and bonds change their portfolio several times a year, it is difficult to distinguish the effects of changes in stock prices from that of the household's policy with respect to selling and buying. It is well known that changes in the portfolio can easily be more important for the results than price changes. Any attempt to correct for these developments would therefore require arbitrary decisions.

of mortgages and life insurances are quite popular, mainly for fiscal reasons. These mortgages are reported in the SEP as such and are therefore included in the analysis. In summary, the definition of net wealth that is used in this paper is:

NET WEALTH = SAVINGS ON DEPOSITS+
SAVING CERTIFICATES+
BONDS, MORTGAGES+
STOCKS, OPTIONS+
OTHER SAVINGS+
MONEY LEND+
CREDIT ON CHECKING ACCOUNT
- (TOTAL DEBT LOAN OR CREDIT+
OTHER LOANS[8]+
OTHER DEBTS+
NEGATIVE BALANCE CHECKING ACCOUNT).

Home equity is defined as the difference between the value of the house and the mortgage loan.
Table 3 shows the development of average disposable income, average net wealth and home-ownership among SEP respondents. Although average income is higher in 1994 than it was in 1987, it decreases from 1991 onwards. Average net wealth increases also over the years.
In Table 4 renters and owner-occupiers are separated. Average disposable income of renters is much lower than that of owner-occupiers, which is no surprise. The differences in net wealth among both groups are more pronounced. In all years net wealth of the owner-occupiers (recall that this does not include housing) is much larger on average than that of renters. Moreover, between 1987 and 1994 the average net wealth of both groups increased by approximately the same percentage.[9] These figures therefore give no

Table 4 Renters en owner-occupiers

	Renters		Owner-occupiers			
Year	Average Income	Average Net wealth	Average Income	Average Net wealth	Average Home Equity	Av. Home Eq. / Av. Net Wealth
1987	29,937	10,918	44,544	33,929	75,974	2.24
1988	30,530	9,164	47,435	23,595	77,199	3.27
1989	30,861	11,840	48,316	31,569	83,099	2.63
1990	30,163	10,838	54,338	30,264	91,059	3.01
1991	31,271	12,985	58,848	36,356	94,407	2.60
1992	31,042	12,613	57,692	36,652	99,465	2.71
1993	30,733	13,190	54,742	36,870	113,246	3.07
1994	30,292	14,301	53,367	44,914	126,286	2.81

[8] This component does not include mortgage loans.
[9] The increase in net wealth of renters is 30.9%, that of owner-occupiers 32.4%.

indication of either reduced savings by owner occupiers or of increased savings by renters as a consequence of the appreciation of housing. On the other hand, housing equity increased on average by 60%, which is even more than the 47% increase in the average value of the houses of owner-occupiers. At first sight, it appears that the higher house prices have not influenced active savings, as measured by differences in net wealth, and have led to an increase in passive savings in the form of equity. In the next sections we will investigate these developments in greater detail by focusing on the level of individual rather than average households.

4 The Demand for Second Mortgages

In this section we discuss the influence of the increasing house prices on the demand for second mortgage. Several authors (Muellbauer and Murphy, 1991, Dutch Central Bank, 1999) have stressed the importance of the ability to cash the increased value of the house for the effect of house price increases on consumption and savings. A natural way to cash the higher wealth associated with the higher house price is to take a second mortgage. However, it is important to note that this is not the only possible way. A household may, for instance, decide to save less on bank accounts, because of the higher house prices. We should also note that a higher value of the house, in combination with relaxed credit constraints, might induce households to substitute other forms of credit for a second mortgage. Other varieties of consumer credit (e.g. that linked to the purchase of durable goods such as cars) are usually only available at relatively high interest rates, whereas mortgages have relatively low interest rates. There is therefore often a rationale for substitution from other kinds of credit to a (second) mortgage. Especially in a period when mortgage qualification constraints change, one should be aware of this possibility. In short, taking a second mortgage is neither a necessary nor a sufficient condition for higher house prices to have an effect on consumption and saving.

It may, nevertheless, be useful to study the effect of higher house prices on the demand for second mortgages. As has been mentioned above, some of the relevant literature has suggested that it is an important channel through which the effect of higher house prices on consumption flows. Studying the effect of higher house prices on second mortgages may therefore be regarded as a first step in studying the complete effect. The results presented in this section should be interpreted from this perspective.

The socio-economic panel (SEP) informs us about the value of the mortgage in each year, but does not give explicit information about second mortgages. Changes in the reported value of the mortgage for subsequent years signal redeeming and borrowing behavior. However, this information is noisy because owner-occupiers sometimes round of the amounts to multiples of 10 or 50 thousand Dutch guilders, whereas they did not do so in the preceding year (or vice versa). We have therefore defined second mortgages as an increase in the reported amount of the mortgage in subsequent years of at least 10.000 Dutch guilders.

Before reporting our results on the demand for second mortgages, we discuss one check on our data. If the increase in house prices is caused by an upswing in the economic conditions, one can easily imagine that some people have chosen to redeem their mortgage at a faster rate. For instance, if people dislike having debts a higher income may be used to reduce the mortgage loan. Of course, one can also imagine that large

Table 5 Changes in mortgages

	1988	1989	1990	1991	1992	1993	1994
Second mortgage	4.7	4.9	5.3	3.1	4.6	6.1	9.1
Small or no change	88.2	87.1	89.8	91.1	89.3	87.8	84.7
Large payoff	7.1	8.0	4.9	5.7	6.1	6.1	6.2
N	1409	1579	1537	1592	1531	1586	1668

The figures in the table refer to respondents who were owner-occupiers in the year *t* appearing on the top of the column and *t-1*, indicated the amount of their mortgage in both years and did not report a move in *t*. Second mortgage: increase in reported mortgage of at least *f* 10.000, large pay off: decrease in mortgage of at least *f* 10.000; small or no change: all other respondents.

payoffs occur less frequently if debts are perceived as less of a burden because of economic prosperity. It is difficult to say *a priori* what the average result will be and it is therefore of some interest to look also at the frequency of large reductions of mortgages. Large payoffs are defined as reductions of more than 10.000 Dutch guilders per year. Table 5 shows the frequency of second mortgages and large payoffs in the years 1988-1994. It appears from the table that the frequency of occurrence of second mortgages has increased, whereas the frequency of occurrence of large payoffs has, if anything, decreased a little. The increase in the demand for second mortgages is especially present in the years 1993 and 1994. The lowest frequency occurs in 1991, which coincides with the turning point of the business cycle.
We conclude that, for the purpose of studying the effect of higher house prices on the demand for mortgage loans of owner-occupiers, it is safe to concentrate attention on the demand for second mortgages. In the remainder of this section we will do so. Table 6 gives some descriptive statistics of the data. The number of observations increases gradually over time. The number of observed second mortgages increases also, especially after 1994. For most of the respondents we do never observe a second mortgages, for some 414 we do so once, whereas a very small number of respondents has taken a second mortgage twice or thrice (47 and 5 respectively). The third panel of the table shows that only a relatively small number of respondents is observed in all seven years contained in the period we study. In order to include the respondents in our analysis, it is necessary that they are observed over at least two subsequent years.
In the remainder of this section we will discuss the models that have been used for the analysis of our data. We start with a probit model and extend it to a tobit model. The two models and the estimation results will be discussed one by one.

A random effects probit model.
We hypothesize that the demand for second mortgages of respondent *i* in year *t* can be described by means of a latent variable y_{it} that is equal to 1 if a second mortgage is taken by household *i* in year *t*, and is equal to 0 otherwise. The value of this variable is specified as:

$$y_{it} = \beta X_{it} + \eta_t + \mu_i + \varepsilon_{it} \qquad \mathbf{1}$$

Table 6 Some descriptive statistics

Year	1988	1989	1990	1991	1992	1993	1994
# obs	1127	1300	1429	1533	1485	1537	1610
# 2nd mortgages	51	51	69	48	66	94	144
Av. amount second mortgage (x1000 Dfl)	37.41	41.08	51.16	31.07	48.93	51.89	47.92

Note. The number of observations reported here refers to the observation used in estimating the model. Due to item non-response on the explanatory variables, these numbers are lower than those reported in Table 5.

In this equation X_{it} is a vector of explanatory variables; η_t is a time effect that is common to all respondents and reflects, for instance, optimism evoked by an upswing in the business cycle; μ_i is a respondent specific effect supposed to be constant over time and reflecting, for instance, reluctance towards the status of a debtor; finally ε_{it} is a normal independent distributed error term. In the standard random effects approach it is assumed that the individual effects μ_i are $N(0,\sigma_\mu^2)$ distributed and that $E(\mu_i|X_{it})=0$. The η_t's will be estimated as year-specific dummy variables.
Equation 1 has the form of the two-way error component model (see, for instance, Baltagi, 1995). It must be noted, however, that y_{it} is a latent variable and that standard techniques for panel data analysis cannot be immediately applied. What we observe is an indicator variable y_{it}* that takes on the value 1 if additional borrowing for a second mortgage takes place and equals zero otherwise. It is possible to derive a probit model from equation 1 by assuming that ε_{it} is standard normal distributed (see, for instance, Maddala, 1987). The random effect approach for modeling the individual effects that we adopt has as a potential drawback that it ignores the possibility that the individual effects are correlated with the explanatory variables. In order to relax this assumption we specify μ_i further as:

$$\mu_i = \mu_i^* + \sum_{k \in K} \nu_k \bar{X}_i \,, \qquad \textbf{2}$$

where μ_i^* is a normally distributed random variable with $E(\mu_i^*|X_{it})=0$. K is the set of explanatory variables that are potentially correlated with the individual-specific effect, the ν's are coefficients to be estimated. A bar on top of a variable denotes its average value over the time periods. This specification is due to Mundlak (1978), who uses it in the context of panel data with continuous variables.
The model has been estimated by means of simulated maximum likelihood.[10] Estimation results are given in the second and third columns of table 7. The table shows that higher wealth reduces the probability of taking a second mortgage, which is consistent with Manchester and Poterba (1989). Income has an insignificant coefficient, but it should be noted that income should be interpreted as transitory income, whereas

[10] Simulations were used to avoid numerical integration over μ_i^*. For each observation 250 independent draws from the standard normal distribution were used.

Table 7 Estimation results for second mortgages

	Random Effects Probit		Random Effects Tobit	
Variable	Estimate	Standard err.	Estimate	Standard err.
Constant	-1.924	0.16	-147.0	13.
Net wealth (t-1)	-0.002160	0.00051	- 0.1541	0.039
Income (t)	0.0006711	0.0016	0.03302	0.12
Equity (t-1)	0.005407	0.00061	0.5363	0.039
Mortgage(t-1)/ Income(t-1)	-0.3987	0.040	-36.57	3.0
Age head	0.003849	0.0022	- 0.3102	0.17
Single	0.7122	0.28	57.68	22.
Family	0.2858	0.10	25.67	7.9
Female headed	0.5995	0.32	51.02	24.
1994	0.1164	0.092	-4.507	7.4
1993	-0.08242	0.097	-8.876	7.8
1992	-0.2145	0.10	- 18.97	8.1
1991	-0.3305	0.10	- 29.25	8.4
1990	-0.2505	0.11	- 17.83	8.9
1989	-0.1091	0.10	- 8.200	8.1
Av. Wealth	-0.0008164	0.00070	- 0.05512	0.051
Av. Income	0.003736	0.0020	0.4141	0.13
Av. Equity	-0.003744	0.00078	- 0.4172	0.053
Av. Mortgage / Income Ratio	0.5127	0.053	46.28	3.9
Av. Single	-0.8709	0.31	-71.80	25.
Av. Family	-0.2737	0.12	-27.07	9.6
Av. Fem. Headed	-0.5115	0.39	- 45.75	30.
σ_μ	0.2355	0.086	16.75	6.9
σ_ε			79.95	2.8
Loglikelihood	-1902.76		-4279.98	

Note. There are 10,654 observations referring to 2607 households.

permanent income effects should be incorporated in the coefficient for average income, which is positive with a t-value of 1.91.

Equity, the variable that is of key interest here, has a significant positive effect on the probability of taking a second mortgage. Increases in equity appear to induce people to take a second mortgage. Since increases in equity are predominantly caused by increases in the perceived value of the house that has been shown to be closely related to actual house prices, this demonstrates that rising house prices have resulted in increasing the demand for second mortgages by Dutch owner-occupiers.

The next variable, the ratio between mortgage and income is introduced into the model as an indicator of the mortgage qualification constraint according to which mortgage

payments may not exceed a certain fraction of income.[11] Such a constraint is widely used in the Netherlands. The coefficients for this variable has the expected negative sign, and is statistically significant.
The age of the head a significant coefficient. Singles and families (=two parents with one or more children) appear to be more inclined to take a second mortgage than the reference group, two adult households without children. The coefficient for female headed households is not statistically significant
The year dummies take up the effects of the business cycle as well as those of changes in credit constraints. 1988 is used as the base year and it appears that in 1990-92 the demand for second mortgages was significantly lower. This suggests that the business cycle reduced the demand for second mortgages. The relaxation of the mortgage qualification constraints in the beginning of the nineties appears to have had no immediate effect on the demand for second mortgages, although other interpretations of these estimation results are also possible.
We have assumed that wealth, income, equity, the mortgage to income ratio and the household characteristics may all be correlated with the individual-specific term. Apart from average income (which indicates permanent income) no interpretation can be given to the values of the estimated coefficients for these variables.
From the viewpoint of the present paper, the most important result is that a positive and statistically significant effect of equity on the propensity to take a second mortgage is found. Since we have controlled for variations in income, wealth, the business cycle, relaxation of credit constraints and correlation of some explanatory variables with individual effects, this result appears to be reasonably robust. Note in particular that the coefficient for equity is estimated on the basis of changes in its value over time, since the average of that variable is also incorporated as an explanatory variable in order to deal with possible correlation between equity and the individual specific term.

A Tobit model
In addition to the information we used in estimating the probit model, we also know the value of the second mortgage, if it is taken. It is therefore possible to extend the probit model discussed above by using this additional information as well. We have done so by formulating a tobit model. In this model the probability the value of the variable y_{it} is interpreted as the desired value of a second mortgage. This value is observed if it exceeds the threshold of 10,000 Dutch guilders.
Proceeding in the same way as for the probit model, we arrive at a tobit model for panel data that can be estimated by simulated maximum likelihood. Estimation results for this model are shown in the third and fourth columns of table 7.
We again find a positive and statistically highly significant coefficient for home equity. The mortgage to income ratio again has a significantly negative coefficient. The tobit model indicates that these variables do not only influence the frequency of second mortgages, but also their size.

[11] These indicators is a ratio and are therefore sensitive to exceptionally low values of the numerators due to (for instance) reporting errors. In order to avoid possible biases due to such outliers, the ratio has been truncated. The truncation value is 5.

Permanent income effects should be incorporated in the coefficient for average income, which is now significant. The other estimation results are also broadly consistent with those of the probit model.

5 House prices and savings of owner-occupiers

In this section we investigate the relationship between the development of house prices and savings. We define savings as the sum of the differences in net wealth and mortgage loan:

$$s_t = NET\ WEALTH_t - NET\ WEALTH_{t-1} - \left(MORTGAGE\ LOAN_t - MORTGAGE\ LOAN_{t-1}\right) \qquad \mathbf{3}$$

This definition implies that taking a second mortgage is regarded as a dissavings, whereas payoffs on the mortgage are counted as savings. This seems natural, but a problem occurs if changes in home equity are used as a dependent variable. The change in home equity is the difference between the change in housing wealth and the change in the mortgage loan. Since the latter is also part of the definition of savings given in (3), this implies that measurement (reporting) errors in the mortgage influence both sides of the equation. For this reason we have also used another measure of savings, viz. the change in net wealth only.

We estimate a linear equation of the form:

$$s_{it} = \gamma X_{it} + \delta_i + \varphi_t + \varepsilon_{it} \qquad \mathbf{4}$$

Again, this is the two-way error component model. Our panel data allow us to difference away the individual effect. However, the within estimator requires strict exogeneity of the explanatory variables. Since we use the mortgage to income ratio as one of our explanatory variables, and the mortgage is also part of one of our definitions of savings (see eq. 3), this assumption is probably violated (see, for instance, Baltagi, 1995 for a discussion of this issue). Equation 4 is therefore estimated in first differences while using the lagged mortgage to income ratio as an instrument for the unlagged ratio. Estimation results are given in table 8.

The first panel of this table refers to regression where savings as defined in eq. 3 is the dependent variable. In equation I the house price is used as an explanatory variable for the savings in the current year, and no significant effect is found. In equation II we use the changes in the house price as an explanatory variable and here we find a significant coefficient with the expected negative sign.

The second panel of Table 8 refers to regressions that have the change in net wealth as the dependent variable. Home equity (eq. III) and the mortgage (eq. IV) do not have significant coefficients. This suggests that there is no immediate effect of taking a second mortgage on the magnitude of other savings. Our data do therefore not suggest that second mortgages are largely taken as a substitute for other (more expensive) forms of consumer credit.

Summarizing it may be said that our data suggest that the increasing house prices in the Netherlands in the period 1988-1994 had indeed a depressing effect on savings. We

Table 8 Fixed effects estimation results for the savings of homeowners

a) Dependent variable: savings including changes in the mortgage

	Equation I		Equation II	
Variable	Estimate	Se	Estimate	Se
Income (t)	0.07038	0.055	0.07582	0.055
House Price (t-1)	0.02106	0.039		
House Price (t)-House Price (t-1)			- 0.07107	0.025
Mortgage(t-1)/Income(t-1)	8.250	3.0	8.137	3.0
1994	2.319	2.9	2.651	2.9
1993	-2.485	3.1	-1.895	3.0
1992	2.682	3.5	3.029	3.4
1991	0.3408	3.8	0.8454	3.6
1990	-1.997	3.9	- 0.5610	3.7
1989	2.113	4.1	4.098	3.7
N	6944		6944	

b) Dependent variable: savings excluding changes in the mortgage

	Equation III		Equation IV	
Variable	Estimate	Se	Estimate	Se
Income (t)	0.1031	0.051	0.1037	0.051
Equity (t-1)	-0.04719	0.034		
Mortgage (t-1)			- 0.07272	0.061
Mortgage(t-1)/Income(t-1)	-0.5827	0.82	0.00266	0.016
1994	1.446	2.7	2.681	5.8
1993	- 2.475	2.9	-3.111	2.4
1992		3.1	-0.3752	2.3
	0.06922			
1991	- 3.326	3.2	2.051	2.2
1990	- 4.496	3.3	- 2.323	2.1
1989	3.521	3.4	3.145	2.0
N	6944		6944	

Note. Households that have moved house in the period 1988-1994 have been excluded. Estimates were based on first differences with the mortgage to income ratio in (t-1) used as an instrument for its first difference.

found no evidence that the increasing demand for second mortgages in this period was largely due to substitution from other forms of consumer credit. The equations we estimated control for individual effects as well as for effects of the business cycle and

relaxations of credit constraints.[12] The implied effect is relatively large: if the value of the house increases by 1 Dutch guilder, savings decrease by 0.07 Dutch guilder.

6 House prices and the savings of renters

In order to analyze the effect of an increase in house prices on the savings of renters, we have estimated an equation similar to equation 4 of the previous section for this group of households. Before we were able to do so, some issues had to be clarified. The first is that we cannot expect the presence of such an effect for all renters. Those who do not consider buying a house have no reason to let higher house prices induce them to save either less or more. Since we cannot distinguish would-be homeowners from other renters directly, we have to use other variables that will indicate a desire to buy a house. For this purpose we defined a new dummy variable that is equal to one for households consisting of at least two persons and with a head aged at most 35 years, and zero for all other households. We used this dummy as an indicator for would-be-homeowners (wbh) and introduced our indicators of house prices only for those households.

The second issue is that it is unclear which house a renter will buy and what determines this decision. It is conceivable that higher house prices will induce substitution from larger to smaller houses among renters who move to the owner-occupied part of the housing market. We have solved this problem in a particularly simple way by taking the median house price as reported by the Dutch Association of Realtors as the relevant indicator for the price of a house bought by a renter. This means that we assume that the relevant substitution effect is incorporated in the house price index that we use. The median house price is used as an explanatory variable in equation I.

Table 9 Fixed effects estimation results for the savings of renters

	Equation I		Equation II		Equation III	
Variable	Estimate	*Se*	Estimate	*se*	Estimate	*Se*
Constant	0.6670	*0.27*	0.6571	*0.27*	0.6624	*0.27*
Income (t)	0.2526	*0.023*	0.2566	*0.024*	0.2491	*0.023*
Wbh	6.455	*6.7*	9.938	*4.2*	-0.5782	*1.6*
House price*wbh	-0.4044	*0.34*				
Housing exp*wbh			- 0.7712	*0.31*		
Δ House price * wbh					9.008	*18*
1994	2.805	*1.7*	2.923	*1.7*	2.386	*1.7*
1993	0.1009	*0.73*	0.2797	*0.72*	-0.2005	*0.71*
1992	0.9498	*0.69*	1.325	*0.71*	0.7696	*0.68*
1991	1.438	*0.65*	1.867	*0.68*	1.396	*0.65*
1990	-0.4285	*0.64*	- 0.07823	*0.66*	-0.4647	*0.64*
1989	1.413	*0.62*	1.536	*0.62*	1.357	*0.62*
N	8417		8417		8417	

Note. Households that have moved house in the period 1988-1994 have been excluded. The variable wbh is the indicator for would-be homeowners discussed in the text. Estimation results were reached with the within estimator.

[12] However, we should note that the standard errors reported in Table 8 are not robust to heteroskedasticity.

One may also hypothesize that it is not the house price per se that is important for the would-be owners, but their housing expenditures after buying a house. We have therefore computed a simple indicator for this variable by multiplying the value of the median sold house by the mortgage interest rate. In this way we attempt to take into account that the effect of higher house prices on housing expenditures that can be compensated by lower interest rates. This gives rise to equation II.
In equation III we use the change in the median house price as an explanatory variable. Since this variable leads to a significant coefficient in the savings equation for owner-occupiers, it seems also of interest to include in the analogous equation for renters.
The savings of renters are defined as the change in their net wealth. Since the mortgage to income ratio does not appear as an explanatory variable in the equation, there seems no reason to use dynamic panel data methods and the results appearing in Table 9 were reached by the conventional 'within' estimator.
For the purposes of the present paper, the most important feature of these results is the lack of a significant effect of increasing house prices on the savings of renters. In all three equations the indicators of the house price are insignificant, and in two of them they also have the wrong sign. If we use other definitions of the group of would-be owner-occupiers (for instance those younger than 30 or 40 years, only households with three or more persons) the results do not improve. We have also experimented with the ratio between the median house price and income as an explanatory variable, and also with the ratio between housing expenditure and income (indicating the mortgage qualification constraint), but remained unable to obtain a significant coefficient. We must therefore conclude that, according to these results, the existence of a (strong) effect of house prices on the savings of renters that can reasonably be regarded as would-be owners is absent in our data.

7 Conclusion

The main findings of this paper can be summarized as follows:

- there is a significant effect of equity on the demand for second mortgages
- the savings of homeowners are affected by increases in house prices
- changes in the mortgage do not appear to be used as substitutes for other forms of consumer credit
- there is no effect of the increase in house prices on the savings of renters.

Our findings deviate from much of the earlier literature that studied the direct effect of an increase in house prices on the savings of homeowners, which often concluded that no such effect could be found. Exceptions are Engelhardt (1996) who could only detect a significant effect of *decreases* in house prices and Attanasio and Weber (1994) who only found an effect for older owner-occupiers.
Our findings with respect to the savings of renters that can be qualified as would-be owners are in marked contrast with the literature. We do not find such an effect. A probable explanation for this result is that the down payment constraint is less important in the Netherlands than elsewhere. The relevant credit constraint in the Netherlands is a mortgage qualification constraint that focuses on the ration between mortgage expenditures and income. Starting homeowners are often able to borrow 100% of the value of their first owner occupied home if this constraint is taken into account. It may be noted that this suggests that higher house prices have an effect on consumption

expenditures of first time homebuyers *after* they enter the owner-occupied part of the market because of the higher mortgage expenditures. However, studying this effect is outside the scope of this paper. Another explanation for the results on the savings of renters is that the present paper is apparently the first to study the possible effect of house prices on the savings of renters by means of panel data.

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