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Sale Price Expectations and Mortgage Commitment:

Inaccuracy versus Price Setting Behaviour

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Abstract

This paper investigates why the homeowner's expectation about the sale price of a house deviates from its market price. This paper has two distinct contributions. First, we argue that sale price expectations are individual specific. Omitting this individual effect leads to biased hedonic estimates. As a result, hedonic estimates conditional on individual characteristics are preferred. Second, we economically interpret the individual effect in terms of inaccuracy of homeowners and a specific type of price setting behaviour ("fishing for a relatively high selling price"). In particular, we focus on the role of mortgage commitment, which is measured by the loan-to-income ratio. We argue that homeowners with a higher loan-to-income ratio are less likely to move. Consequently, they incur a low opportunity cost of fishing. They are also less inclined to search. As a result, homeowners with a higher loan-to-income ratio might have more incentive to fish for a higher sale price, but they may also be less accurate with regard to the market price. Our estimates confirm these two hypotheses.

Keywords: house price, sale price expectation, mark-up, mortgage

JEL classification: D83; D84; G12

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1. Introduction

The expectation of a homeowner regarding the sale price of his house does not always equal the market price. This paper investigates two reasons why both prices might deviate: inaccuracy of the homeowner and price setting behaviour. The contribution of this paper to the literature is twofold.

First, we show that standard hedonic estimates will be biased when the sale price that is expected by the homeowner (the so-called own house price valuation) is used as dependent variable. In particular, we argue that sale price expectations are individual-specific. Hence, the omission of the individual-specific effects leads to biased hedonic estimates if the individual-specific effects and house-specific effects are correlated. We use a novel argument to explain this correlation. Specifically, a relationship between individual-specific effects and house-specific effects can be the result of the sorting of households across particular types of houses. Our explanation differs from previous studies, which argue that hedonic estimates will be biased if the deviation of the own house price valuation from the market price is house specific (e.g. Ihlanfeldt and Martinez-Vazquez, 1986; Goodman and Ittner, 1992; Kiel and Zabel, 1999). In those studies, the role of individual characteristics, specifically in relation to the bias in hedonic estimates, remains unclear.

The second contribution of this paper is to economically interpret the individual effect. We relate this effect to inaccuracy, as well as "fishing" for a higher price, which is a specific type of price setting behaviour from the seller. Most of the previous studies that investigate the validity of the own house price valuation for hedonic purposes interpret any discrepancy of the own house price valuation from the market price as bias, inaccuracy or measurement error (e.g. Kish and Lansing, 1954; Kain and Quigley, 1972; Robins and West, 1977; Follain and Malpezzi, 1981; Ihlanfeldt and Martinez-Vazquez, 1986; Goodman and Ittner, 1992; Kiel and Zabel, 1999). The inclusion of price setting behaviour jointly with inaccuracy provides a direct link between these studies (the hedonic approach) and those studies that investigate the price setting decision of homeowners, which is usually based on list/transaction prices (e.g. Horowitz, 1992; Genesove and Mayer, 1997; Glower et al., 1998; Genesove and Mayer, 2001; Anglin et al., 2003; Herrin et al., 2004). To give an explicit economic interpretation, we focus on the effect of mortgage commitment, which is measured by the loan payment relative to household income. In particular, Stein (1995) argues that homeowners with a high level of debt might be less likely to

move house due to down-payment constraints. In addition, homeowners who do not move have a low opportunity cost of fishing, while successful fishing leads to an exogenous trade gain. This reasoning provides a possible explanation for the results in a seminal paper by Genesove and Mayer (1997). They demonstrate that homeowners in the Boston condominium market who face a down-payment constraint, captured by the mortgage loan-to-assessed value, have a higher list price mark-up over the assessed value of the home due to higher reservation prices.[1] Our paper relates to this paper. In particular, we argue that a similar reasoning as given by Stein (1995) can be used to explain a causal relationship between the loan-to-income ratio and sale price expectations. However, the central question remains whether homeowners are price setters in the housing market, or just inaccurate with regard to the market price? We argue that homeowners who are less likely to move, due to a high loan-to-income ratio, are also less inclined to search. Consequently, they are less accurate.

The estimates in this paper are based on a unique dataset of about 30 thousand homeowners, including potential movers and non-movers, from the Dutch Housing Demand Survey (WoON) of 2006 that is merged with both the officially assessed value of the house and official taxable income records. To control for unobserved individual and house characteristics, we include zip code fixed effects. We identify price setting behaviour by evaluating the own house price valuation as a mark-up against the officially assessed value of the house.[2] The unexplained variation in the own house price valuation is interpreted as inaccuracy. With regard to the institutional setting, the Netherlands lacks a statutory minimum down payment, in contrast to the US and various other European countries.[3] Hence, this setup allows us to focus directly on mortgage qualification based on income, without down payments as a confounding factor.

The remainder of this paper is organized as follows. Section 2 discusses the institutional setting. Section 3 presents the underlying theory. Section 4 puts forward

[1] Those households with a lower loan-to-value ratio also spent a longer time on the market. In general, the seller trades off the possibility of a higher selling price versus the costs associated with a longer time on the market (see Anglin et al., 2003; Genesove and Mayer, 1997; Glower, 1998; Horowitz, 1992; Herrin et al., 2004).

[2] The assessed value as a benchmark is not uncommon in the price index literature (see Clapp and Giacotto, 1998, in relation to the hedonic method; Bourassa et al., 2006 for the SPAR index).

[3] Nevertheless, the outstanding mortgage amount in a country without a statutory minimum down payment can be interpreted as an informal constraint imposed by banks (in relation to homeownership rates, see Chiuri and Jappelli, 2003).

the methodology and empirical model. Section 5 discusses the data. Section 6 shows the main results while section 7 discusses the conclusions.

2. Institutional Setting: Assessed Values and Mortgages

As of 1995, Dutch law stipulates that each of the municipalities in the Netherlands is required to make an estimate of the market value of all of its buildings.[4] This results in an officially assessed value, which is denoted by the acronym WOZ. The assessments were performed on a semi-regular basis (1st of January in 1995, 1999, 2003, 2005, 2007, and 2008). The assessed value is mainly used for tax purposes in the years following the date of valuation.[5] The municipality (assessor) bases the assessed value on the recent sale price of the house.[6] [7] The assessed value is not based on the outstanding mortgage of a household. If the sale price is not available, the house will be compared with houses in the direct neighbourhood. A special government body is required to monitor, inspect, and approve the final assessed values.[8] This paper utilizes the officially assessed value of residential property at the 1st of January 2003. This was the relevant reference value for taxation in the years 2005 and 2006. By law (article 24 of the WOZ law), the municipalities were required to send a notice with the assessed value to the homeowner before the 28th of February 2005, which ensures that this value was available to the subjects in the early 2006 survey on which our analysis is based.[9] [10] Homeowners were allowed to object to the assessed value. However, they had to do so within six weeks of the 28th of February 2005, which limited the time available to

[4] The law is denoted by the name "Wet WOZ" (1994).
[5] Property tax (OZB) by municipalities, Income tax (Eigen Woning Forfait) and tax for water quantity management. Valuation has occurred annually (used for taxation in the following year) since 2007.
[6] By law (Kadasterwet), the sales prices and some general house characteristics are also recorded by a separate organization (the Kadaster).
[7] Based on sale records, the municipality (assessor) tries to give an expected value for the house. If the sale price deviates substantially from this expectation, the reason for such a deviation is investigated (e.g. rebuilds).
[8] This government body is "de Waarderingskamer".
[9] As of 2005 (date of valuation 2003), the notice was combined with the (municipal) property taxation form.
[10] According to article 24 (Wet WOZ), the assessed value after 2003 (i.e. date of valuation 2005) had to be revealed eight weeks after the 1st of January 2007. Hence, this value was still unknown to the respondents in the 2006 survey.

file an objection.[11] Moreover, objections with regard to (lowering) the assessed value were only considered if the decrease in value was above a certain threshold.[12]

Dutch homeowners are not required to make a down-payment for the purchase of a home. Mortgage qualification is mainly based on the amount of income that a household generates.[13] Most lenders provide mortgages of up to 125 percent of the execution value (85-90 percent of the sale value) of the home and, as a rule of thumb, a monthly loan payment one third of the monthly gross income is allowed.[14] It is permitted to finance transaction costs, such as transfer taxation, directly with the mortgage. Mortgage rents are tax deductable.[15] [16] As a consequence, this paper utilizes the official taxable income records of 2005 (taxable household income), which adjust for those taxes.[17] There are several mortgage types available for households to finance a home. Mortgage life insurance consists of a loan and a life insurance part. No pay-off is made, but interest and a savings premium are paid. The accumulated savings are used to repay the mortgage. This is called an endowment mortgage. The escrow mortgage is similar. However, the premium includes a risk premium to repay the mortgage in the event of death. Investment mortgages are similar to escrow mortgages in the sense that the loan is repaid with a deposit. However, the deposit is based on investments. In essence, this mortgage is a special form of the no pay-off mortgage. With the no pay-off mortgage, interest is paid during the duration of the mortgage only. At maturity, the principal balance of the loan has to be repaid (e.g. by the proceeds of the sale of the home). A level payment

[11] There is no fixed date at which a municipality has to decide whether the objection is regarded as legitimate. The assessed values corrected for the objections were not included in the data we utilized.
[12] For instance, a minimum of five percent if the house is below 200,000 euros and a minimum of four percent (10,000 euros) if the house is between 200,000 euros and 500,000 euros. Most houses in the Netherlands are within these ranges.
[13] Utilizing own capital to buy a house or a highly valued house (assessed value) may result in more favourable borrowing conditions.
[14] Credit is relatively unrestricted in comparison to other countries (see Chiuri and Jappelli, 2003). This can lead to substantial leverage. Since the 1st of January 2007, mortgage lenders have had to base the maximum loan on the conditions used in the national insurance scheme (e.g. maximum of 42.4% of income in 2008 based on 6 percent interest as reference).
[15] As of the 1st of January 2004, mortgage rents are only fully tax deductible if the excess housing value after the sale of the house is used for the purchase of the new home. This creates an institutional link between sale prices and mortgages.
[16] As of the 1st of January 1995, borrowers can access lower mortgage interest rates by using the national insurance scheme against default, which results in lower default risk premiums on mortgages.
[17] From 1993 onward, the income of the spouse may also be included in the mortgage attainment procedure. This possibly created an exogenous shock in the loan-to-income ratios for married couples. The increase in finance possibilities of households with double earners was stated in "de tweeverdienersregeling".

(amortization) mortgage has a mortgage loan payment that consists of interest and capital repayment. This amount remains fixed for a particular chosen period. In this paper, we have no information about this fixed interest rate period. At the beginning of the repayment scheme, the payment largely consists of interest. With a linear mortgage, a fixed payment is made each month. The interest paid decreases over the years such that the loan payment is relatively low at maturity. With a stocks mortgage, households borrow more than the purchase price of the home. This excess loan is invested in stocks and bonds. A combination of these mortgages or multiple mortgages (for instance, to finance a second home) is possible. There are some other mortgage types such as mortgages that offer the possibility to withdraw (part of) previous payments. Sub-prime mortgages are very rare in the Netherlands.

3. Theory: Mortgages and Sale Price Expectations

This section first relates sale price expectations to a particular type of price setting behaviour of the homeowner. Alternatively, the role of inaccuracy is discussed.

Our motivation for identifying fishing as a particular type of price setting is based on Stein (1995). He shows that there are three groups of homeowners, based on the mortgage value: unconstrained movers, constrained movers, and non-movers.[18] Subsequently, he discusses the possibility that homeowners can either fish for an above market price or that they can achieve the market price with certainty. In particular, non-movers have no opportunity cost of fishing, while successful fishing might allow such homeowners to move. However, movers face the possibility of losing the opportunity to move (and the associated exogenous trade gains). Hence, Stein concludes that "there should be more fishing … in the non-mover range" (Stein, 1995, p. 400). This paper investigates this claim in relation to the loan-to-income ratio. The effect of the loan-to-income ratio is similar to the down-payment case.

In particular, Stein (1995) discusses a three-period model. At period one, a homeowner has one unit of housing stock including debt K denoted in the numeraire good food. In period two, households can buy a home of size H. In period three, labour income earned is $1+K$. Homeowners repay their mortgage. Hence, they have a net income of $1+K-K+P$, one unit of food and one unit of housing. Subsequently, homeowners achieve utility $U=\alpha\ln(H)+(1-\alpha)\ln(F)+\theta M$, where H is the housing good, F is food and θ are exogenous trade gains if a homeowner moves ($M=1$).

[18] We do not distinguish between a homeowner or household as a unit of analysis. This avoids the discussion of intra-household allocation and decision making.

Homeowners are ambivalent about moving if $U = \alpha \ln(H) + (1-\alpha)\ln(1+P-PH) + \theta = 0$. Stein argues that the homeowner has a down-payment constraint $PH \leq (P-K)/\gamma$, where γ is the down-payment requirement. Substituting the maximum amount of *H* that a homeowner can buy in the utility function leads to an implicit function, which defines the threshold level of debt *K** for which a homeowner is indifferent between moving or not moving. The difference in our analysis is that the down-payment constraint is replaced by a mortgage qualification constraint based on income. In particular, households face a loan-to-income ratio of $\frac{rK}{I}$, where r is the loan-payment-to-mortgage multiplier (interest rate) and *I* is the exogenous income in period one. Hence, rK is the interest households pay. The total maximum amount a household can borrow is assumed to be 1. Hence, $1-\frac{rK}{I}$ is the loan-to-income available to spend on housing *H*. However, this is a constant ratio which, in itself, says nothing about the level of *H* a household consumes. Multiplying by income *I* gives again the loan households pay on the remaining borrowing capacity. This loan payment is assumed to be associated with a level of debt through (dividing by) the loan payment to mortgage multiplier r. This level of debt determines the amount of housing consumed. Hence,

$$H = \frac{I}{r}(1-\frac{rK}{I}) = \frac{I}{r} - K \qquad (1)$$

Equation (1) can again be used in the utility function to implicitly define the level of debt at which households are indifferent about moving. Hence, it is only the formula that restricts housing demand that is different from Stein (1995). Households with higher levels of debt (a higher loan-to-income ratio) are more likely to exceed the threshold level of debt and, consequently, they are less likely to move. In essence, a high mortgage commitment diminishes the amount left for households to borrow in the future (i.e. they can spend less on future housing), which limits their ability to move.[19]

With regard to fishing behaviour, Stein (1995) argues that a homeowner who does not want to move (*M=0*) incurs no opportunity cost of fishing (*Opp=0*). The decision not to move is characterized by a reservation price p_r that is higher than the

[19] A main limitation of this model is that it is static. The intertemporal choice between current and future housing is not incorporated.

market price p_m. If the homeowner decides to fish for an above market price (i.e. a mark-up), he might get lucky with chance q, such that he can sell his house for the reservation price. Subsequently, he can reap the benefits from trade θ. In addition, with chance z the homeowner sells his house above the reservation price. This additional price gain leads to the benefit B. Hence, with a chance $q+z$ the homeowner receives a sale price above the reservation price. With a chance $1-q-z$ he incurs the opportunity cost of fishing. The expected value of fishing is $q\theta+zB$. Consequently, this homeowner will always expect a positive value of fishing, if q, z, the trade gain θ, and the additional benefit B are positive. We compare this outcome with a homeowner who decides to move. The reservation price of this homeowner is below the market price. If this homeowner does not fish, he will obtain the trade gain with certainty. Hence, this is his opportunity cost of fishing. However, he might be able to obtain some extra money out of the sale of his home, which provides him with the utility equivalent gain θ with chance q and additional benefit B with chance z. His expected value of fishing is $(2q+z-1)\theta+zB$. Hence, if $|(2q+z-1)\theta|>zB$ and $(2q+z-1)\theta<0$ (i.e. $2q+z<1$) the homeowner does not decide to fish. In contrast, the homeowner who decides not to move always has an incentive to fish due to the low opportunity cost of fishing.

To summarize, homeowners with a higher loan-to-income ratio are less likely to move. As a consequence, they are more inclined to fish, so that they will be able to move and reap the benefits of trade. Homeowners with a lower loan-to-income ratio are less inclined to fish for a higher price. They only search for a higher price to obtain additional benefits. If they fish for a higher price, they will face the possibility that they will have to deal with the opportunity cost of fishing. We expect to find that these incentives determine the sale price expectations of homeowners.[20] Note that the existence of such expectations (i.e. a mark-up) is not unreasonable, given imperfect arbitrage as a result of market imperfections. In particular, buyers face substantial search and transaction costs; houses are differentiated products; and the characteristics of a seller are private information relative to the market. All of these market characteristics allow the homeowner to act as a price setter in the housing market.

[20] A contradictory argument is that households in a better financial position are able to wait longer to obtain higher prices. Even though they are able to, they are less inclined to do so given the opportunity cost they incur.

The limitations of this theory are clear. Homeowners want a higher sale price for their home such that they can consume more and reap the benefits of trade. Hence, price setting behaviour is not the result of bargaining strength, and acute financial distress is ignored. However, the explanation of Stein (1995) is quite general. In particular, all factors that affect the decision to move have an effect on price setting behaviour. As mentioned, this paper mainly focuses on the effect of the loan-to-income ratio. However, the role of, for instance, capital gains is discussed in one of the extensions.

Next, we discuss the inaccuracy of the homeowner, which is a second common argument used to explain why homeowners deviate from market prices. Assume that homeowners have some degree of knowledge π about market prices p_m, such that the perceived market price is $p_m + \pi$. If homeowners are fully knowledgeable ($\pi = 0$), they know the market price. However, homeowners have imperfect information about the market price (i.e. due to search costs or cognitive constraints). Assume that their knowledge depends on search effort s, $\pi = f(s)$. If homeowners who are less likely to move (i.e. higher loan-to-income ratio) also search less for market price information, a positive relationship between inaccuracy and the loan-to-income ratio is to be expected.

Of course, this simple argument could be extended by recognizing that the effectiveness of a search and the processing of knowledge depend on search technology. For instance, highly educated people are more accurate due to the search technology they possess. In addition, the accuracy of homeowners might depend on price signals, for example, as a result of turnover in the market or the government provision of information about house value. These extensions are, although interesting, not the main point of investigation in this study.

4. Methodology and the Empirical Model

This section argues that hedonic estimates based on the own house price valuation are biased. Subsequently, it discusses the estimation of the parameters associated with price setting behaviour and inaccuracy.

We argue that the expected sale price consists of three additively separable components:

$$v_i = p_f(x_i) + p_p(x_i, h_i) + p_{inf}(x_i, h_i) \qquad (2)$$

where v_i is the own house price valuation for homeowner i, p_f is the fundamental price of the home, p_p is the part of the own house price valuation related to price setting behaviour, and p_{inf} is the part of the own house price valuation due to inaccuracy. The price setting behaviour and the inaccuracy of the homeowner both capture the individual-specific nature of the own house price valuation. Both components are determined by x_i, which is a vector of house characteristics (i.e. location, time, amount and quality of the housing consumption) and h_i, which is a vector of individual characteristics (or household characteristics).

The fundamental price (p_f) can be considered to be a constant value part of a house that is dependent on the housing good x_i and that is independent of the individual characteristics. As a consequence, this part is called a house-specific effect. The fundamental price ensures that, even without price setting behaviour and inaccuracy, the house has a value. This value in such a case equals the aggregate market price (the standard hedonic case). However, it seems more likely that there is price setting behaviour and inaccuracy, given the theory we provided above. Hence, the fundamental price is not the aggregate market price, unless the individual effects cancel/aggregate out. In the classical hedonic approach (i.e. Rosen, 1974), individual characteristics play a role only insofar as they determine the marginal attribute prices. Hence, the house is usually the unit of analysis in the estimation of a hedonic model, instead of the individual.

The own house price valuation (equation (2)) can be parameterized (ignoring interaction terms) as,

$$v_i = x_i^{'}\beta + h_i^{'}\gamma + \varepsilon_i \tag{3}$$

where β is the parameter vector associated with the house characteristics, γ captures the effect of individual characteristics and ε_i is a composite error term including unobserved house heterogeneity, φ_i, and unobserved individual effects, η_i.

The main conclusion based on equation (3) is that omitting individual characteristics (e.g. the loan-to-income ratio) leads to a bias of the hedonic coefficients if sale price expectations are determined by individual characteristics (i.e. see theory), and individual and house characteristics are correlated.[21] Such a correlation is not unreasonable if there is sorting of individuals in the housing market.

[21] To be precise, this leads to inconsistent estimates. The violation of the zero conditional mean assumption leads to bias. In the main text, both terms are used interchangeably.

To give an indication of the size of the bias, we will show a hedonic estimate and an augmented hedonic model (equation (3)) in the empirical part. Unobserved local amenities (φ_i) and socio-economic status (η_i) will be captured by zip code fixed effects. In addition, we will provide evidence of sorting.

The usual argument for biased hedonic estimates is that a deviation from market prices is house specific. In particular, p_m is the real variable of interest in equation (3), but only v_i is observed (i.e. $\chi_i = v_i - p_m^*$).[22] However, support for a systematic deviation is mixed. Ihlanfeldt and Martinez-Vazquez (1986) find such evidence in relation to house characteristics (also separately for individual characteristics). Goodman and Ittner (1992) and Kiel and Zabel (1999) do not find such evidence (conditional upon individual characteristics).[23] Nevertheless, in this setup the relationship between the individual characteristics and the bias in standard hedonic estimates remains vague. More importantly, the economic role of the individual characteristics in such hedonic estimates is unclear. Ihlanfeldt and Martinez-Vazquez (1986) include individual characteristics in the hedonic model to proxy for unobserved house characteristics. In contrast, we argue that individual characteristics might simply be a measure of individual behaviour.

In this paper, the individual characteristics are related to the inaccuracy of the homeowner and price setting behaviour. In particular, the effect of individual characteristics (i.e. γ) can be interpreted from a price setting behaviour (γ_2) and an inaccuracy (γ_3) perspective (i.e. $\gamma = \gamma_1 + \gamma_2 + \gamma_3$, where $\gamma_1 = 0$, since the fundamental price is not directly affected by individual characteristics). The same applies to the parameters on the house characteristics ($\beta = \beta_1 + \beta_2 + \beta_3$). Hence, the estimation of equation (3) leads to an identification problem if interest lies in the individual parameter estimates. In this paper, interest lies in the parameters (γ_2 and γ_3) on the loan-to-income ratio. Consequently, we need additional information to identify these parameters.[24]

[22] We argue that the sale price expectation is the main variable of interest, not the unobserved market price. Consequently, it is inappropriate to interpret a deviation from the market price as a measurement error.

[23] Although this may be a result of the low sample size they utilize. Kiel and Zabel (1999) do find that the length of residence has an effect.

[24] Alternatively, if theory predicts an opposite effect of γ_2 versus γ_3, it is at least possible to make a statement regarding which effect dominates based on the total effect. If an individual characteristic

We estimate the price setting behaviour parameters by the evaluation of the own house price valuation as a mark-up against the officially assessed value of the home,

$$p_p(x_i, h_i) = markup_i = v_i - a_i = x_i'\beta_2 + h_i'\gamma_2 + u_i \quad (4)$$

where a_i is the assessed value of the home and u_i is an error term. The mark-up is supposed to capture the price setting behaviour part (i.e. β_2 and γ_2). In particular, we assume that the (officially) assessed price of the house is known ex ante to the homeowner and is used as a reference value.[25] This ensures that variation in the mark-up is not due to inaccuracy.[26] In contrast to the assessed value, the (hedonic) predicted price (Ihlanfeldt and Martinez-Vazquez, 1986) or subsequent sale price (Goodman and Ittner, 1992) are commonly not a priori known to the household.[27] By the comparison of the merged officially assessed values to the assessed value available in the survey, this paper is at least able to give some indicative evidence whether the benchmark is known.[28]

After substitution of the mark-up from equation (4) into equation (2), some rewriting and parameterization of the remaining fundamental price component term and inaccuracy term, we get

$$a_i = x_i'\beta_{1,3} + h_i'\gamma_3 + \mu_i \quad (5)$$

where μ_i is an error term (i.e. $\varepsilon_i - u_i$). Hence, an auxiliary regression based on the assessed value will capture the fundamental price and inaccuracy component. In

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uniquely affects price setting behaviour or inaccuracy (i.e. $\gamma_2 = 0$ or $\gamma_3 = 0$), there would be no identification problem. However, based on the previous theoretical arguments, both possibilities are, in relation to the loan-to-income ratio, not true.

[25] In particular, the reference value assumption ensures that the assessed value is the (only) relevant benchmark that homeowners use in their expectations. As a consequence, other explanations are excluded. For instance, Dusanski and Koç (2007) base price expectation on previous prices and show that this can result in an upward sloping demand curve.

[26] If the own house price valuation and the officially assessed value have a similar fundamental price component, which we implicitly assumed in equation (4), the effects of house characteristics associated with the fundamental price are differenced out. If price setting behaviour is independent of house characteristics a joint significance test on those characteristics could provide a test of the similarity of the fundamental price component between the assessed value and own house price valuation. We will show this significance test in the result section. In addition, if the assessed value (benchmark) incorporates price setting behaviour, price setting behaviour (the remaining individual/house characteristics) would difference out. This could explain the result by Goodman and Ittner (1992), Kiel and Zabel (1999).

[27] Although the previous sale price of the house used by Kiel and Zabel (1999) is more likely to satisfy this assumption.

[28] The use of the officially assessed value comes at a cost; it is less likely to be known than the survey assessed value. However, the survey assessed value is only available for a selection of homeowners.

particular, the variation in the own house price valuation that is left unexplained by the mark-up or fundamental price is interpreted as inaccuracy (see equation (2)).[29]

A final benefit of our approach is that the own house price valuation and assessed value are available for the entire market of potential sellers. Genesove and Mayer (1997) found the effect of the loan-to-value on the mark-up for a subsample of sellers only. However, the decision to sell (to move) may crucially be dependent on prices (the mark-up), which may result in sample selection bias (see Gatzlaff and Haurin, 1998; Goetzman and Peng, 2006). This is a problem which may affect most list/transaction price studies. As a correction, it is possible to use the standard Heckman approach.[30] We will show a decision to move regression, since it plays a role in the theory we provided, although we do not need it to correct for sample selection bias.

The main critique against the proposed method is the use of the officially assessed value as a benchmark. In particular, this benchmark may (systematically) deviate from the actual benchmark used by homeowners due to several reasons.[31] First, the assessed value might be a conservative market price estimate by the government, to avoid objections by homeowners. The only evidence we provide is that the officially assessed value does seem to act as a lower boundary on expectations. Second, the expected benchmark may also deviate from the assessed value due to tax evasion. As mentioned, this effect might be mitigated due to the time available to file for an official objection and the restrictions imposed on such objections. Third, there is a lag in the date of valuation (i.e. the beginning of 2003 versus the survey date at

[29] Although this reasoning is used to obtain the parameter estimates associated with inaccuracy, it does not provide us with a direct measure of inaccuracy. The main difficulty is that all components in equation (2) are possibly related. As a result we do not have, for instance, a direct measure of the fundamental price in the own house price valuation model. If inaccuracy is independent of house characteristics, we could use house characteristics to capture the fundamental price and the mark-up (or individual characteristics that are assumed to uniquely affect price setting behaviour) to capture price setting behaviour. In addition, if inaccuracy and price setting behaviour/fundamental price are not related, the resulting parameter estimates would be consistent. Consequently, the unexplained variation in the own house price valuation could provide a direct measure of inaccuracy. However, it is very likely that inaccuracy and price setting behaviour/fundamental price are correlated, since they are based on similar determinants.

[30] However, in order to identify (not only through the non-linear functional form) the effect of sample selection, additional variables in the selection equation are required. Usually ad hoc measures are used, with the exclusion restriction imposed that such measures do not affect the sale price. For instance, Gatzlaff and Haurin (1998) use a widow indicator variable and Ihlanfeldt and Martinez-Vazquez (1986) use family size, number of workers, recent birth of a child, the presence of school aged-children, crowding and excess space indicators.

[31] If the assessed value deviates from the homeowner's benchmark independently of individual and house characteristics, the estimates remain unchanged. Furthermore, note that the benchmark used by homeowners does not necessarily have to equal the market price.

the end of 2005). The assessed value was at least revealed to the homeowners (February 2005) relatively close to the survey date. Even if the assessed value is adjusted by inflation factors per municipality, only the zip code fixed effects would change.[32] Nevertheless, in one of the extensions an individual-specific measure of capital gains is included as an additional conditioning variable. Fourth, the officially assessed value may exhibit coding and measurement error. This is usually not deemed a problem if the measurement error is in the dependent variable.

A final critique against the use of the mark-up is that its level may depend on market conditions at a particular point in time (e.g. a sellers market). Without information on the mark-up at different points in time, we cannot investigate this issue. In particular, we are not interested in the level of the mark-up, but on the structure within the mark-up.

To summarize, we will show a hedonic regression based on the own house price valuation, a hedonic regression augmented with individual characteristics, an auxiliary regression based on the officially assessed value, the percentage mark-up regression and a residential mobility regression. All models were estimated with OLS.[33]

5. Data and Descriptive Statistics

We have used the Dutch Housing Demand Survey of 2006 (WoON 2006), provided by the Netherlands Ministry of Housing, Spatial Planning and the Environment (VROM). The resulting dataset contains 64,005 respondents (a response rate of 60 percent) questioned over eight months, from August 2005-March 2006 (pooled cross sections).[34] Of the 64,005 respondents, 21,547 singles or head/partners reported the mark-up (survey assessed value and own house price valuation). The number of observations is severely constrained, since only 71.7 percent of the approximately 30,000 homeowners reported the assessed value. In comparison, the monthly mortgage loan payment had a response of 86.3 percent (10.6 percent did not know, 3.1 percent refused) and the own house price valuation had a response of 87.7

[32] However, diverging inflation paths per house type per zip code would not be captured.
[33] Note that some of the equations (e.g. the own valuation and assessed value model), could also be estimated jointly by SUR, but the benefits are, in our opinion, marginal. In particular, SUR estimated by feasible GLS may give more efficient estimates if errors for a given individual are correlated across equations (they are usually still assumed to be independent across i). However, since exactly the same regressors are used across equations (or if the errors are uncorrelated across equations) this estimator collapses to simple System OLS. Moreover, System OLS is just equation-by-equation OLS if the errors are uncorrelated across equations. In this paper, it was decided to use standard OLS.
[34] Note that this includes the over sampling in some municipalities.

percent. As a consequence, merged data (by Statistics Netherlands) of officially assessed values (date of valuation 2003) are used. In addition, the taxing authorities provided the relevant taxable income data to the Netherlands Ministry of Housing, Spatial Planning and the Environment.[35] After the merge of the officially assessed values and taxable incomes, the sample size is 30,294 observations.

[-TABLES 1 AND 2 ABOUT HERE-]

The sample excludes outliers as follows. Houses with a year of build before 1850 and a size larger than 450m2 are excluded. Moreover, houses attached to a farm or with a shop as part of the house are kept out of the analysis to ensure that the residential value of the home is not mixed with business value (i.e. the largest selection).[36] The mark-up is constrained between -1 and 1 and a household with a loan payment more than 100 percent of income is excluded from the analysis. Furthermore, we exclude households with zero or negative income. In addition, a household size larger than 10, and those households with a mortgage which have a remaining duration of more than 40 years, will not be included in the analysis. After this selection, 27,860 observations are left.[37] Due to missing values across the variables some additional observations are lost (27,786 remain). Finally, zip codes with only one observation are excluded, resulting in 27,262 final observations for estimation. Based on this sample, the descriptive statistics of the main dependent (house prices) and independent variables (financial position) are reported in Table 1. The descriptive statistics of the controls (other individual characteristics, house characteristics) are in Table 2.

[-FIGURE 1 ABOUT HERE-]

5.1 Dependent variables: House prices and the mark-up

Respondents were asked: "for how much do you think the house could be sold (without household effects)?". Their average response, the own house price valuation, amounted to 283,245 euros. In comparison, average transaction prices, based on the median price per house type weighted by sales, were 228,500 euros in the last quarter of 2005 (as reported by the Dutch Association of Realtors). The officially assessed

[35] 73 percent of the income records were based on the year 2005, 27 percent were based on 2004 values and were raised with the contractual loan increases of 2005.
[36] A special type of house denoted by living unit (in Dutch "wooneenheid") was also excluded.
[37] Note that the effect of the loan-to–income ratio on the percentage mark-up is already significant and of the expected sign if only zero and negative income is excluded.

value is substantially lower, 236,707 euros.[38] Hence, this resulted in an absolute mark-up of the own valuation against the officially assessed value of 46,539 euros, or around 17 percent. In particular, the mark-up is predominantly positive with some weak truncation at zero, which is in accordance with the argument of nominal loss aversion (see Genesove and Mayer, 2001) and suggests that the officially assessed value indeed acts as a reference value in terms of a lower boundary on sale price expectations (see kernel density estimates, Figure 1).[39]

[-FIGURE 2 ABOUT HERE-]

Does the provision of price information by governments spill through in the knowledge of homeowners? In particular, we assumed that homeowners know the officially assessed value. The descriptive statistics in Table 1 show that the survey assessed value is on average only 162 euros higher than the officially assessed value. The kernel density of the difference in the survey and official value is plotted in Figure 2. There is a substantial peak in the density around 0. This is an indication that most homeowners know the officially assessed value, although there are substantial outliers.[40]

5.2 Main independent variables: Financial position

The main independent variable is the monthly mortgage payment (interest, premium, capital repayment) in euros compared to the monthly taxable household income in euros. Homeowners with multiple mortgages (13.1 percent) reported the total mortgage amount and the total loan payment. The taxable household income is a measure which includes the tax benefits related to mortgage payments (mortgage rent deductibility). The mortgage loan payments constituted around 15.5 percent of taxable household income, based on an average monthly taxable household income of 3,963 euros and an average mortgage loan of 122,671 euros.

[-FIGURE 3 ABOUT HERE-]

[38] The average officially assessed value is larger than the average transaction price in 2005, which suggests that the houses sampled in the survey may be biased towards higher valued houses. However, for the regression estimates, sample selection based on the independent variables is usually not seen as a problem.

[39] There is an unexpected peak in the mark-up at 0.4, which does not affect the main regression results.

[40] Unreported regression results based on the (absolute log) difference between the survey and the official assessed value as a dependent variable suggest that there is also not much evidence of a systematic deviation (F-value house characteristics of 3.11, F- value individual characteristics of 5.25). There is meagre evidence that homeowners with a higher loan-to-income ratio are also less accurate (coefficient of 0.02, s.e. of 0.011). These results are indicative only, since they are based on the restricted survey sample of respondents who reported the assessed value.

Figure 3 displays the kernel density estimates of the loan-to-income ratio. The distribution is skewed to the right. The peak around zero is due to households with no outstanding mortgage (13.2 percent of the sample). This distribution resembles the distribution of the mortgage loan-to-assessed value reported by Genesove and Mayer (1997). The loan-to-value is not used in this study, since it is meant to capture down-payment constraints and the Netherlands does not have such constraints. Moreover, the use of the loan-to-income ratio has an additional benefit, since it avoids the same denominator in the mark-up and the independent variable of interest (i.e., as in Genesove and Mayer, 1997). The average loan-to-value is 58 percent.

Finally, in extension to Genesove and Mayer (1997), ten mortgage types (the largest part of the sample, 27 percent, has a no-payoff mortgage) and the remaining mortgage duration (15 years on average) are used in the analysis.[41] Both measures pick up the unobserved heterogeneity in the loan-to-income ratio, for instance due to differences in payment schemes. In addition, the type of mortgage may cover for differences in risk attitudes.

5.3 Further controls: Other individual characteristics and house characteristics

The substantial amount of control variables is a clear benefit of the dataset. As mentioned, statistics about further controls are contained in Table 2. Further individual characteristics that act as controls include: youngest child between 0-5 (dummy), no child (dummy), respondent obtained a university/hbo degree (dummy), gender (dummy), household size, household type (eight types), age and age squared. The housing good is defined by categorical dummies of size in square meters (seven categories), dummies for different classes of houses (six classes), a dummy whether a garden is present, a distance to centre dummy (five categories) and a dummy whether technical maintenance was performed in the last half year. Finally, zip code fixed effects (2,608 zip codes) and month of questioning dummies (eight months) were added.

The sample averages of the control variables are as follows: 55 percent of the homeowners have no children; 35 percent completed higher education; 52 percent are females; average household size is 2.7 persons; 37 percent have a partner without children, and 41 percent have a partner with children; the average age is 49 years.

[41] These control variables are based on the mortgage for which homeowners had to pay the most.

With respect to house characteristics, average size is about 144 m2, 20 percent of the houses were built before 1945; 20 percent are terraced houses (32 percent); 41 percent of the houses are located within 15 minutes from the centre of the place of residence; 85 percent have a garden; 23 percent of the respondents did technical maintenance within the last half year.

[-FIGURE 4 ABOUT HERE-]

6. Empirical Results

6.1 Non-parametric regression

Figure 4 estimates the relationship between the percentage mark-up and the loan-to-income ratio non-parametrically (kernel regression). There is a clear positive relationship between the two variables. Households with a low loan-to-income ratio also expect a mark-up, but smaller than those households with a higher loan-to-income ratio. Hence, we do not find threshold effects, as in Genesove and Mayer (1997).

[-TABLE 3 ABOUT HERE-]

6.2 Multivariate regression

The estimation results are reported in Table 3.[42] Column 1 shows a standard hedonic regression based on the own house price valuation. Since a log-level model is estimated and a substantial amount of dummy variables are included, it is important to note that the coefficients should be interpreted according to $\exp(\beta\Delta x)-1$. For instance, apartments are 50 percent cheaper (coefficient -0.699) relative to detached homes, ceteris paribus. Moreover, an increase in the size (m2) of the home increases the perceived hedonic value of the home, but at a decreasing marginal rate. The largest homes (>300 m2) were around 48% more expensive than the smallest category of houses (<50 m2). Note that most of the house characteristics are highly jointly significant (F-value of 546). In addition, the Hausman specification test suggests that it is important to include the zip code fixed effects. The linear fit is large for a standard micro regression (48 percent of the variation in the log of the own valuation is explained by the independent variables).

[-TABLE 4 ABOUT HERE-]

Column 2 adds individual characteristics such as the loan-to-income ratio, to the hedonic regression. The inclusion of the significant individual characteristics (F-

[42] Appendix 1 discusses the role of the mark-up (the estimates) in the Dutch housing market.

value equals 57) seems to affect the hedonic estimates substantially. For instance, the largest category of homes is only 42 percent higher in value relative to the smallest category of homes (in comparison to 48 percent earlier on). Hence, the standard hedonic estimates seem to be biased by the exclusion of the individual characteristics. These results shed doubt on the use of the own house price valuation in standard hedonic regressions. However, this outcome can be explained if particular types of individuals live in particular types of houses, for instance, through sorting. Table 4 shows evidence of sorting. It reports the frequency distribution of household types across size categories of homes. For instance, partners with children seem to predominately live in houses of sizes between 100m2 and 150m2. Singles mostly live in smaller homes (i.e. 50m2 to a 100m2). Finally, an increase of 1 percentage point in the loan-to-income ratio increases the own house price valuation by 17 percent, ceteris paribus. This is quite a large effect and may reflect the substantial heterogeneity in sale price expectations.

Column 3 reports an auxiliary regression based on the officially assessed value as a dependent variable. Most individual characteristics (F-value 54) and house characteristics (F-value 454) are statistically significant.

Column 4 reports the results based on the percentage mark-up.[43] In particular, the parameters are exactly the difference between the parameters of the own house price valuation regression (column 2) and the officially assessed value regression (column 3). There is a substantial decline in the significance of the house characteristics (F-value of 10 in contrast to the previous F-value of 445 in the own house price valuation regression). This result suggests that a substantial amount of house heterogeneity is differenced out, which is in accordance with the results in Goodman and Ittner (1992) and Kiel and Zabel (1999). However, the house characteristics are still significant, which indicates that there is not an exact fundamental price component in the own house price valuation and the assessed value. For instance, the mark-up is highest for the largest size category of homes and in the centre of a city.[44] The mark-up regression shows that most individual characteristics are no longer significant (F-value of 6.5). However, mortgage commitment still seems

[43] The use of the log squeezes the (mainly positive) range of the mark-up. Hence, the coefficient on the loan-to-income ratio in a regression based on the actual percentage mark-up is somewhat higher.
[44] Nevertheless, the assumption that house characteristics are differenced out does not lead to a substantially different loan-to-income coefficient (i.e. 0.080, s.e. 0.012)). This provides some evidence in favour of the method used by Ihlanfeldt and Martinez-Vazquez (1986), to only include individual characteristics in a mark-up regression.

to matter. Column 4 shows that, of the 17 percent effect on sale price expectations, after a percentage point increase in the loan-to-income ratio, 7 percent is due to pricing setting behaviour, ceteris paribus.[45] As mentioned before, this result can be explained by expectations about "fishing". The remaining effect of 10 percent stays unexplained (i.e. the coefficients in the assessed value regression, column 3). This unexplained part can be interpreted as inaccuracy.[46] Hence, with respect to the loan-to-income ratio, the results indicate that homeowners with a higher loan-to-income ratio are also less accurate. As mentioned, this result can be explained by a decrease in the mobility of those households, if a lower mobility implies a decrease in search.

One of the main critiques against the mark-up is the omitted effect of previous price changes (i.e. capital gains). This is, in particular, relevant for the mark-up used in this paper, since the assessed value has a valuation date of 2003. As a consequence, column 5 shows the results with a measure of capital gains included in the mark-up regression. Capital gains until 2003 are assumed to be included in the assessed value. Capital gains from 2003 until the date a particular individual is surveyed are calculated based on price data from the Dutch Association of Realtors. They weight per house type the median house price by turnover. This results in a weighted average house price for 76 regions in the Netherlands. On average, this resulted in capital gains of 25,382 euros per individual (see Table 1). The capital gains are scaled by the original buy price of the home. This ensures that the measure of capital gains is individual specific (i.e. not perfectly collinear with the zip code fixed effects). If homeowners know about the size of the capital gains (even if they bought the house at a later date than 2003), and capital gains are the predominant factor in the mark-up, it is expected that capital gains is positively related to the mark-up. In contrast, the fishing hypothesis suggests that households with relatively high capital gains are especially less inclined to have a high mark-up. Column 5 shows that results are in favour of the fishing hypothesis. An increase in the percentage capital gains has a

[45] The mark-up model can be considered as a transformed model to identify price setting behaviour in the original model (i.e. equation (3)). Hence, the interpretation of the estimated parameters should be in the setup of the original model. In contrast, the mark-up equation might be viewed as being of interest on its own. A percentage point increase in the loan-to-income ratio increases the mark-up by 0.07 percent, around 3,258 euros.

[46] However, for education this interpretation leads to a strange result. A higher education may be associated with more inaccuracy. This suggests that the unexplained part in the own house price valuation might capture other forces than inaccuracy alone. Education has an effect that goes beyond the price setting behaviour captured by the mark-up.

negative effect on the mark-up.[47] More importantly, the effect of the loan-to-income ratio remains virtually unchanged.

Finally, column 6 shows that, as predicted by the inaccuracy and fishing hypothesis, a higher loan-to-income ratio is associated with a decrease in the likelihood to move. A Linear Probability Model is estimated to keep the method and model as close as possible to the previous regressions. The predicted values range between -0.076 and 0.560 with an average predicted mobility of 0.176 and a standard error of the predicted value of 0.076. This suggests that the predicted values stay predominately in the [0,1] range. For instance, a standard deviation increase in the loan-to-income ratio decreases the preference to move within two years by 1.3 percentage points, ceteris paribus. This is not a large effect relative to, for instance, some demographic variables.

6.3 Robustness checks

This sub-section discusses various robustness checks of the mark-up regression (Table 3, column 4). We report standard errors in parentheses. A subsample of homeowners who want to move (4,787 observations) results in a statistically insignificant coefficient on the loan-to-income ratio of 0.0312 (0.027), whereas those who did not want to move had a significant coefficient of 0.0689 (0.013). This is in accordance with the proposition as stated by Stein (1995).

In addition, three different measures of income and one different measure of loan payment were used. The monthly mortgage payment included interest, premium and capital repayment. The loan-to-income ratio, based on interest only, results in a coefficient of 0.068 (0.013). The loan-to-income ratio effect, based on gross household income, was 0.098 (0.016). The definition used by the Netherlands Ministry of Housing, Spatial Planning and the Environment (VROM) gave a coefficient of 0.076 (0.012). Based on the definition used by Statistics Netherlands (CBS), the coefficient was 0.107 (0.012). It seems that the coefficients are relatively stable, even with the use of different income or loan payment measures. Both income definitions of VROM and CBS are disposable household income. The main difference is the treatment of housing. The VROM-definition, for instance, excludes government

[47] Actual percentage capital gains (i.e. based on the own house price valuation and the original buy price) had a small positive effect on the mark-up of 0.002 and no significant effect on the decision to move. However, this measure has the same numerator as the mark-up. Hence, a positive relationship is to be expected. In addition, the capital gains are not necessarily as of 2003. In the end, the price index capital gains may well differ from capital gains used in the decision of homeowners (i.e. measurement error). In such a case, the effects as reported in this paper may well be understated (attenuation bias).

subsidies to homeowners. A detailed description of the different income measures is available in the research documentation of the Netherlands Ministry of Housing, Spatial Planning and the Environment.

The mark-up results are based on the officially assessed value of the home. Based on the survey-assessed value (19,813 observations), the estimated coefficient on the loan-to- income ratio was 0.040 (0.020), which suggests that the non-response in the survey value seems to lead to an underestimation of the loan-to-income effect.

The effect of the loan-to-income ratio in an absolute mark-up regression was 24,366 euros (5,018 euros) (i.e. a percentage point increase in the loan-to-income ratio has an effect of 244 euros on the mark-up) against a total effect in the own house price valuation regression of 56,605 euros (7,211 euros). A correction in the level of the mark-up by the level of capital gains results in a loan-to-income effect of 24,176 euros (5,026 euros), which is virtually the same as the uncorrected results.[48]

The inclusion of the loan-to-value ratio instead of the loan-to-income ratio in the mark-up regression results in a coefficient on the mark-up of 0.070 (0.006), which is close to the loan-to-income effect.

Some other robustness checks were also done. A regression for the municipality with the largest amount of observations in our dataset (‘s-Gravenhage, 820 observations) resulted in a loan-to-income ratio effect of 0.112 (0.055). Some municipalities were oversampled. After the exclusion of oversampling (17,600 observations are left) the estimated coefficient was 0.0644 (0.014). Excluding households without a mortgage (23,658 observations are left) gave a significant coefficient of 0.0746 (0.012). Excluding house characteristics and zip code fixed effects resulted in a loan-to-income coefficient of 0.068 (0.011). A standard bivariate regression of the mark-up on the loan-to-income ratio gave a coefficient of 0.063 (0.009). In general, the parameter estimates seem quite robust.

7. Conclusion

If we believe that expectations play an important role in the individual decision making process and the economy as a whole, it is of fundamental importance to understand such expectations. Our conclusions with regard to sale price expectations are twofold.

[48] However, the coefficient on the loan-to-income ratio is not exactly the same. This result is due to the construction of the capital gains, which are calculated until the date the respondent was surveyed. This introduces some variation per individual. Consequently, not only the coefficients on the zip code fixed effects change, but also the coefficient on the loan-to-income ratio.

First, we conclude that the use of the own house price valuation for hedonic purposes will lead to biased hedonic estimates when individual effects are omitted. For instance, in a hedonic setup augmented with individual characteristics, estimates indicated that the largest category of homes was 42 percent higher in value relative to the smallest category of homes. However, standard hedonic results showed an effect of 48 percent, the difference being 6 percentage points. This bias can be explained by the relationship between individual-specific effects and house-specific effects through sorting. For example, households with children live in larger homes than singles. These results are important, since the hedonic approach is widely applied in empirical research. For instance, biased hedonic coefficients as a result of the use of the own house price valuation as dependent variable also question the usefulness of such estimates to generate housing demand and, subsequently, estimate housing demand parameters (e.g. Ioannides and Zabel, 2003; Dusansky and Koç, 2007). The implication of these results is that a proper estimate of market value should be based on the augmented hedonic approach. In particular, the reason for including individual characteristics in a hedonic model may not only be to proxy for omitted house/neighbourhood characteristics (i.e. see Ihlanfeldt and Martinez-Vazquez, 1986), but more fundamentally to condition on individual/household behaviour.

Second, the individual effect should be directly related to the sale price expectation for the bias to occur. Hence, this paper contributes by providing an economic rationale for such a relationship in terms of price setting behaviour and inaccuracy. Results indicate that homeowners with a higher loan-to-income ratio have higher sale price expectations. Around 40 percent of this effect is related to price setting behaviour. In particular, households with a higher loan-to-income ratio require a higher mark-up. This is in line with the fishing hypothesis by Stein (1995). Households with a higher loan-to-income ratio are less likely to move and, in particular, non-movers do not incur the opportunity cost of fishing for a higher price. Households appear to "fish" before the sale of the current home. According to Genesove and Mayer (1997), households also seem to realize their perceived prices. Hence, information about the seller, besides what is sold, might prove to be of considerable importance for buyers. Further results showed that homeowners with a higher loan-to-income ratio were also less accurate. We argue that households that are less mobile in the housing market are also less inclined to search for additional market price information. Around 60 percent of the loan-to-income effect is attributed to

inaccuracy. Thus, homeowners are inaccurate, but they also act as price setters in the housing market.

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Appendix 1: Abolishing the favourable fiscal treatment of homes

This section provides additional insight with regard to the size of the mark-up and capital gains for the Dutch housing market. Subsequently, to show the relevance of the regression estimates from a policy point of view, the effects of abolishing the favourable fiscal treatment of owning a home are discussed.

The total sample of 64,005 respondents is associated with 7,127,469 households in the Netherlands.[49] The sample of 27,262 homeowners amounts to around 3,373,242 homeowners. As mentioned, average transaction prices were around 228,500 euros in the last quarter of 2005, which results in a total housing portfolio of about 771 billion euros. The total mark-up is 160 billion euros. The accrued capital gains between 2003 and the end of 2005 are about 72 billion euros. Hence, the excess market return latent in the Dutch housing market of 2006 is 82 billion euros. A similar result is obtained if the difference in mark-up and capital gains in Table 1 are multiplied by the number of total homeowners. The excess returns homeowners expect from housing are quite substantial. In addition, these expectations might not be unreasonable, given the substantial house price increases in the Netherlands for the past decade and could be a driving force for subsequent price changes. Whether such expectations are realized remains an open question. In particular, only 17.56% of homeowners want to move within two years. Given the assumption that those homeowners move, 14.4 billion euros of the 82 billion euros mark-up should be realized in the two years after 2006. Of course, consumption plans might have subsequently changed due to the credit crisis.

Households in the Netherlands receive a net favourable fiscal treatment through their possession of a home. In particular, they are allowed to deduct their mortgage loan payments from the income on which taxes are levied. In addition, they have to add fictitious income (based on the officially assessed value) as the result of the possession of a home. Some households also pay rents to the owner of the land the house is built on. This leads to a net fiscal advantage for homeowners of 177 euros per month (s.d. 383). This is around 4.8% of taxable household income. The net fiscal treatment is positive for 76% of the sample. Note that households, on average, deduct

[49] To calculate aggregate figures for the Dutch economy, the sample outcomes are weighted by frequency weights. The average weight is 123.7342 (s.d. 92.89). These weights are available in the dataset provided by the Netherlands Ministry of Housing, Spatial Planning and the Environment. They are created using an extensive list of population characteristics of the Netherlands. In particular, age, place in household, ethnicity, income, residence type and location indicators are used.

507 euros (s.d. 790) from their monthly taxable income, pay additional income tax of 101 euros (s.d. 69) per month and pay land rents of 62 euros (s.d. 92) per month. Hence, the possibility of deducting mortgage loan payments from taxable income explains a particularly large part of the net tax benefit.

Based on the estimates in this paper (assumed to be policy invariant), it is possible to evaluate the effect of a change in the net tax benefit (abolishing favourable tax treatment). The loan-to-income ratio (i.e. income) is adjusted by the tax benefit per individual, which resulted in a higher average loan-to-income ratio of 1.8 percentage points. However, note that around 50% of homeowners will only have a small or no change in the loan-to-income ratio (i.e. median of loan-to-income ratio change of 0.39 percentage points). Subsequently, the change in loan-to-income ratios are evaluated at the estimates in the absolute mark-up regression (i.e. 243.66 euros more mark-up after a percentage point increase in the loan-to-income ratio). Hence, the increase in loan-to-income ratio would increase the mark-up by 1.5 billion euros. Homeowners would also become less accurate. Although we cannot calculate the total amount of inaccuracy, the estimates suggest that this amount would increase by 2.0 billion euros after removing the net tax benefit. These effects are not very large, especially given the fact that only a small proportion spills through within two years (i.e. only some households move within two years). In addition, note that the effect on turnover is marginal. The chance to move within two years would only decrease by 0.2 percentage points. Note that these estimates do not take into account effects though the general price level (i.e. reduction in demand) or second order effects of capital gains on turnover.

Table 1: Descriptive statistics, house prices and financial position

Variables	Mean	Std.dev.	p25	p50	p75
House prices					
Own house price valuation (Euros)	283,245	154,749	190,000	245,000	330,407
Officially assessed value (Euros)	236,707	125,370	161,000	207,000	275,000
Log (Officially assessed value)	12.2724	0.4358	11.9892	12.2405	12.5245
Log (Own house price valuation)	12.4458	0.4478	12.1548	12.4090	12.7081
Mark-up percentage [log own valuation – log officially assessed value]	0.1734	0.1897	0.0655	0.1668	0.2852
Mark-up absolute [own valuation – officially assessed value]	46,539	69,617	13,300	35,000	67,000
Difference survey and officially assessed value a)	162	162,728	-55,000	0	6,000
Absolute difference survey and officially assessed value [|survey assessed- officially assessed|] a)	33,431	159,258	1,000	10,427	36,412
Absolute percentage difference survey and official assessed value [|log(survey assessed)- log(officially assessed)|] a)	0.1269	0.2097	0.0047	0.0520	0.1778
Original buy price (Euros)	130,513	103,590	63,529	107,546	174,705
Capital gains 2003-2005 (based on price index NVM, Euros)	25,382	11,521	19,400	25,500	31,800
Capital gains percentage [Capital gains 2003-2005/Original buy price]	0.4215	0.7368	0.1231	0.2231	0.4099
Financial Position					
Mortgage Loan payment To Taxable Household Income (fraction)	0.1554	0.1355	0.0614	0.1313	0.2174
Mortgage Loan Payment (monthly, Euros)	539	453	232	490	750
Taxable Household Income (monthly, Euros)	3,963	2,886	2,391	3,510	4,891
Mortgage (Euros)	122,671	113,292	47,647	102,000	175,000
Loan-to-Assessed Value (fraction)	0.5764	0.5143	0.2230	0.4940	0.8911
Mortgage_nr (1 if number of mortgages=2, 0 if nr.= 0 or 1)	0.1311	0.3376	0	0	0
Mortgagetype1 (1 if mortgage life insurance)	0.0686	0.2528	0	0	0
Mortgagetype2 (1 if escrow mortgage)	0.1525	0.3595	0	0	0
Mortgagetype3 (1 if investment mortgage)	0.0570	0.2317	0	0	0
Mortgagetype4 (1 if no-payoff mortgage)	0.2711	0.4445	0	0	1
Mortgagetype5 (1 if level payment (amortization) mortgage)	0.0478	0.2133	0	0	0
Mortgagetype6 (1 if linear mortgage)	0.0146	0.1200	0	0	0
Mortgagetype7 (1 if stocks mortgage)	0.0025	0.0495	0	0	0
Mortgagetype8 (1 if other type of mortgage)	0.0118	0.1082	0	0	0
Mortgagetype9 (1 if combination mortgage)	0.2420	0.4283	0	0	0
Mortgagetype10 (1 if no mortgage)	0.1322	0.3387	0	0	0
Remaining mortgage duration (years)	14.81	10.47	5	15	25
Decision to move					
Want to move (1 if prefer to move) b)	0.1756	0.3805	0	0	0
Length of residence (years) c)	14.52	12.43	5	11	21
Number of observations	27,262				

Notes: Only the condition dummy=1 is specified with the implicit understanding 0 otherwise. All values are unweighted sample averages. a) the difference between survey and officially assessed value is based on 19,814 observations due to non-response. b) want to move=1 included respondents that, within 2 years: want to move; want to move, but cannot find a house; maybe want to move; already found a home; have to move. c) the length of residence is viewed as intrinsically related to the decision to move and as a consequence it is not included as an individual characteristic in the regressions.

Table 2: Descriptive statistics, other individual and house characteristics

Variables	Mean	Std.dev.	p25	p50	p75
Other Individual characteristics					
Youngestchild0_5 (1 if child between 0 and 5)	0.1678	0.3737	0	0	0
Nochild (1 if no child)	0.5536	0.4971	0	1	1
Higheduc (1 if completed higher education)	0.3523	0.4777	0	0	1
Female (1 if female)	0.5174	0.4997	0	1	1
Household size (nr.)	2.661	1.228	2	2	4
Householdtype1 (1 if partners without children)	0.3681	0.4823	0	0	1
Householdtype2 (1 if partners with children)	0.4115	0.4921	0	0	1
Householdtype3 (1 if partners with children and others)	0.0042	0.0645	0	0	0
Householdtype4 (1 if partners with others)	0.0017	0.0410	0	0	0
Householdtype5 (1 if single parent with children)	0.0304	0.1716	0	0	0
Householdtype6 (1 if single parent with and with others)	0.0005	0.0227	0	0	0
Householdtype7 (1 if other composition)	0.0077	0.0872	0	0	0
Householdtype8 (1 if single)	0.1760	0.3808	0	0	0
Age (years)	49.20	14.86	37	48	59
House characteristics					
Size (m2) a)	144.24	67.61	100	130	175
Buildingyear1 (<1945)	0.2018	0.4014	0	0	0
Buildingyear2 (>=1945 and <=1959)	0.0806	0.2723	0	0	0
Buildingyear3 (>=1960 and <=1969)	0.1236	0.3291	0	0	0
Buildingyear4 (>=1970 and <=1979)	0.1853	0.3886	0	0	0
Buildingyear5 (>=1980 and <=1989)	0.1534	0.3603	0	0	0
Buildingyear6 (>=1990 and <=1999)	0.1722	0.3776	0	0	0
Buildingyear7 (>=2000)	0.0830	0.2760	0	0	0
Houseclass1 (1 if detached)	0.1946	0.3959	0	0	0
Houseclass2 (1 if semi-detached)	0.1890	0.3915	0	0	0
Houseclass3 (1 if corner)	0.1455	0.3526	0	0	0
Houseclass4 (1 if terraced)	0.3174	0.4655	0	0	1
Houseclass5 (1 if other)	0.0125	0.1113	0	0	0
Houseclass6 (1 if apartment)	0.1411	0.3480	0	0	0
Distancetocentre1 (1 if in centre)	0.1342	0.3409	0	0	0
Distancetocentre2 (1 if 15 min from centre)	0.4139	0.4925	0	0	1
Distancetocentre3 (1 if >15)	0.1747	0.3797	0	0	0
Distancetocentre4 (1 if suburb)	0.2279	0.4195	0	0	0
Distancetocentre5 (1 if rural)	0.0493	0.2164	0	0	0
Garden (1 if garden)	0.8547	0.3524	1	1	1
Techmaintenance (1 if technical maintenance conducted within the last half year)	0.2330	0.4226	0	0	0
Nr. of zip codes b)	2,606				
Nr. of months of questioning	8				
Number of observations	27,262				

Notes: Only the condition dummy=1 is specified with the implicit understanding 0 otherwise. All values are unweighted sample averages. a) In the regressions we use categorical size dummies. b) average observations per zip code: 10.46, before any selection there where 3495 zip codes.

Table 3: Hedonic, mark-up and the decision to move regressions

	(1)	(2)	(3)	(4)	(5)	(6)
Model type	**Hedonic**	**Hedonic with individual characteristics**	**Hedonic with individual characteristics**	**Percentage mark-up**	**Mark-up Conditional on capital gains**	**Decision to move**
Dependent variable	Log(own valuation)	Log(own valuation)	Log(officially assessed value)	Log(own valuation) – Log(officially assessed value)	Log(own valuation) – Log(officially assessed value)	1 if Want to move within 2 years
Financial Position						
Mortgage payment to taxable household income	-	0.170***	0.101***	0.070***	0.066***	-0.094***
		(0.017)	(0.015)	(0.012)	(0.012)	(0.022)
Capital gains percentage (from 2003-2005 across 76 NVM regions)	-	-	-	-	-0.014***	0.012***
					(0.002)	(0.004)
Mortgagetype1	-	-0.023**	-0.024***	0.002	-0.002	0.063***
(1 if mortgage life insurance)		(0.011)	(0.009)	(0.007)	(0.007)	(0.013)
Mortgagetype2	-	-0.049***	-0.046***	-0.003	-0.006	0.056***
(1 if escrow mortgage)		(0.010)	(0.009)	(0.006)	(0.006)	(0.012)
Mortgagetype3	-	-0.029**	-0.030***	0.001	-0.002	0.073***
(1 if investment mortgage)		(0.011)	(0.010)	(0.008)	(0.008)	(0.015)
Mortgagetype4	-	-0.008	-0.010	0.002	-0.002	0.043***
(1 if no-payoff mortgage)		(0.009)	(0.007)	(0.006)	(0.006)	(0.009)
Mortgagetype5	-	-0.050***	-0.043***	-0.006	-0.009	0.063***
(1 if level payment (amortization) mortgage)		(0.011)	(0.010)	(0.008)	(0.008)	(0.014)
Mortgagetype6	-	-0.013	-0.016	0.003	-0.000	0.025
(1 if linear mortgage)		(0.016)	(0.014)	(0.011)	(0.011)	(0.019)
Mortgagetype7	-	-0.083***	-0.073***	-0.010	-0.014	0.143**
(1 if stocks mortgage)		(0.027)	(0.025)	(0.020)	(0.020)	(0.057)
Mortgagetype8	-	-0.014	-0.001	-0.013	-0.016	0.047**
(1 if other mortgage)		(0.021)	(0.017)	(0.015)	(0.014)	(0.022)
Mortgagetype 9	-	-0.032***	-0.030***	-0.002	-0.006	0.058***
(1 if combination mortgage)		(0.009)	(0.008)	(0.006)	(0.006)	(0.011)
Remaining mortgage duration (years)	-	-0.001***	-0.001***	0.00002	0.0001	-0.003***
		(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0003)
Other individual characteristics						
Youngestchild0_5	-	-0.001	-0.0003	-0.0004	-0.0001	0.031***
(1 if child between 0-5)		(0.005)	(0.005)	(0.004)	(0.004)	(0.009)
Nochild (1 if no child)	-	0.008	-0.040	0.049	0.046	-0.251***
		(0.061)	(0.093)	(0.035)	(0.035)	(0.056)
Higheduc	-	0.064***	0.065***	-0.002	-0.003	0.043***
(1 if completed higher education)		(0.004)	(0.003)	(0.003)	(0.003)	(0.006)
Female (1 if female,)	-	0.020***	0.012***	0.008***	0.008***	-0.007
		(0.003)	(0.003)	(0.002)	(0.002)	(0.005)
Householdsize (nr.)	-	0.026***	0.022***	0.005**	0.005**	-0.005
		(0.003)	(0.003)	(0.002)	(0.002)	(0.004)
Householdtype2	-	-0.006	-0.048	0.042	0.039	-0.274***
(1 if partners with children)		(0.061)	(0.093)	(0.035)	(0.035)	(0.056)
Householdtype3	-	0.003	-0.039	0.042	0.040	-0.197***
(1 if partners with children and others)		(0.067)	(0.096)	(0.038)	(0.038)	(0.070)
Householdtype4	-	-0.008	-0.001	-0.007	-0.007	-0.051
(1 if partners with others)		(0.043)	(0.037)	(0.029)	(0.029)	(0.055)
Householdtype5	-	-0.077	-0.085	0.008	0.005	-0.225***
(1 if parent with children)		(0.062)	(0.093)	(0.036)	(0.037)	(0.058)
Householdtype6	-	-0.117	-0.153	0.037	0.033	-0.126
(1 if parent with children and others)		(0.077)	(0.097)	(0.052)	(0.052)	(0.135)
Householdtype7	-	0.015	0.019	-0.005	-0.004	0.118***
(1 if other composition)		(0.023)	(0.019)	(0.017)	(0.017)	(0.031)
Householdtype8	-	-0.080***	-0.059***	-0.021***	-0.020***	0.004
(1 if single)		(0.006)	(0.006)	(0.004)	(0.004)	(0.009)
Age (years) /1000	-	9.593***	9.617***	-0.023	-0.126	-9.900***
		(0.867)	(0.823)	(0.601)	(0.597)	(1.137)
Age_sq /1000	-	-0.056***	-0.055***	-0.001	0.002	0.056***
		(0.008)	(0.008)	(0.006)	(0.006)	(0.010)
House characteristics						
Size2 (1 if >50 and <=100 m2)	0.071***	0.061***	0.051***	0.010	0.008	0.009
	(0.012)	(0.011)	(0.010)	(0.008)	(0.008)	(0.016)
Size3 (1 if >100 and <=150 m2)	0.177***	0.151***	0.133***	0.018**	0.016**	0.004
	(0.012)	(0.012)	(0.011)	(0.008)	(0.008)	(0.015)
Size4 (1 if >150 and <=200 m2)	0.273***	0.236***	0.206***	0.030***	0.028***	0.001

	(0.013)	(0.013)	(0.011)	(0.008)	(0.008)	(0.016)
Size5 (1 if >200 and <=250 m2)	0.330***	0.290***	0.250***	0.040***	0.038***	-0.003
	(0.015)	(0.014)	(0.013)	(0.009)	(0.009)	(0.017)
Size6 (1 if >250 and <=300 m2)	0.390***	0.348***	0.285***	0.063***	0.059***	0.002
	(0.017)	(0.016)	(0.015)	(0.010)	(0.010)	(0.019)
Size7 (1 if >300 m2)	0.392***	0.354***	0.309***	0.044***	0.041***	-0.009
	(0.019)	(0.018)	(0.016)	(0.012)	(0.012)	(0.019)
Buildingyear2 (1 if >=1945 and <=1959)	-0.036***	-0.040***	-0.023***	-0.017***	-0.018***	0.007
	(0.010)	(0.010)	(0.009)	(0.006)	(0.006)	(0.010)
Buildingyear3 (1 if >=1960 and <=1969)	-0.028***	-0.034***	-0.010	-0.024***	-0.025***	0.021**
	(0.009)	(0.009)	(0.008)	(0.005)	(0.005)	(0.009)
Buildingyear4 (1 if >=1970 and <=1979)	0.040***	0.025***	0.050***	-0.026***	-0.031***	0.020**
	(0.009)	(0.009)	(0.008)	(0.005)	(0.005)	(0.009)
Buildingyear5 (1 if >=1980 and <=1989)	0.050***	0.046***	0.077***	-0.031***	-0.036***	0.012
	(0.009)	(0.009)	(0.008)	(0.005)	(0.005)	(0.010)
Buildingyear6 (1 if >=1990 and <=1999)	0.180***	0.174***	0.212***	-0.038***	-0.044***	0.007
	(0.010)	(0.009)	(0.009)	(0.005)	(0.005)	(0.010)
Buildingyear7 (1 if >=2000)	0.270***	0.264***	0.274***	-0.010	-0.016**	-0.040***
	(0.012)	(0.011)	(0.012)	(0.007)	(0.007)	(0.012)
Houseclass2 (1 if semi-detached)	-0.321***	-0.302***	-0.287***	-0.015***	-0.014***	0.018**
	(0.007)	(0.007)	(0.006)	(0.005)	(0.005)	(0.007)
Houseclass3 (1 if corner)	-0.483***	-0.450***	-0.462***	0.012**	0.014***	0.029***
	(0.008)	(0.008)	(0.008)	(0.005)	(0.005)	(0.009)
Houseclass4 (1 if terraced)	-0.582***	-0.539***	-0.537***	-0.002	0.000	0.041***
	(0.008)	(0.008)	(0.008)	(0.005)	(0.005)	(0.008)
Houseclass5 (1 if other)	-0.202***	-0.188***	-0.192***	0.005	0.004	0.009
	(0.022)	(0.021)	(0.020)	(0.011)	(0.011)	(0.020)
Houseclass6 (1 if apartment)	-0.699***	-0.638***	-0.650***	0.013	0.013	0.069***
	(0.016)	(0.015)	(0.015)	(0.008)	(0.008)	(0.015)
Distancetocentre2(1 if 15 min from centre)	-0.032***	-0.027***	-0.004	-0.023***	-0.023***	-0.001
	(0.007)	(0.006)	(0.006)	(0.004)	(0.004)	(0.008)
Distancetocentre3 (1 if >15)	-0.034***	-0.031***	-0.004	-0.026***	-0.026***	-0.005
	(0.008)	(0.008)	(0.007)	(0.005)	(0.005)	(0.010)
Distancetocentre4 (1 if suburb)	-0.007	-0.009	0.011	-0.020***	-0.020***	-0.013
	(0.008)	(0.008)	(0.007)	(0.005)	(0.005)	(0.009)
Distancetocentre5 (1 if rural)	0.044***	0.036***	0.045***	-0.009	-0.009	-0.017
	(0.014)	(0.014)	(0.013)	(0.009)	(0.008)	(0.012)
Garden (1 if garden)	0.062***	0.049***	0.057***	-0.009	-0.008	-0.023*
	(0.011)	(0.010)	(0.009)	(0.006)	(0.006)	(0.013)
Techmaintenance	-0.008**	0.005	-0.002	0.006**	0.006**	-0.028***
(1 if tech. maint. Within the last half year)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.006)
Intercept	12.579***	12.183***	12.050***	0.133***	0.147***	0.749***
	(0.019)	(0.069)	(0.098)	(0.040)	(0.041)	(0.073)
# explanatory variables	29	54	54	54	54	54
Adjusted R-squared	0.48	0.51	0.56	0.02	0.02	0.03
RMSE	0.26	0.25	0.22	0.17	0.17	0.35
Joint Significance Tests						
F-value individual characteristics	-	56.80***	53.99***	6.49***	7.43***	25.18***
F-value house char. (without zip code fixed effect and month of questioning)	545.93***	445.41***	454.23***	10.15***	10.40***	6.52***
Other tests						
Hausman test (chi2) for zip code fixed effects (H0: no difference fe, re)	1235.07***	1021.18***	3355.55***	96.04***	108.76***	93.90***
F-value month of questioning	0.90	1.48	1.13	2.76***	2.63**	1.95*

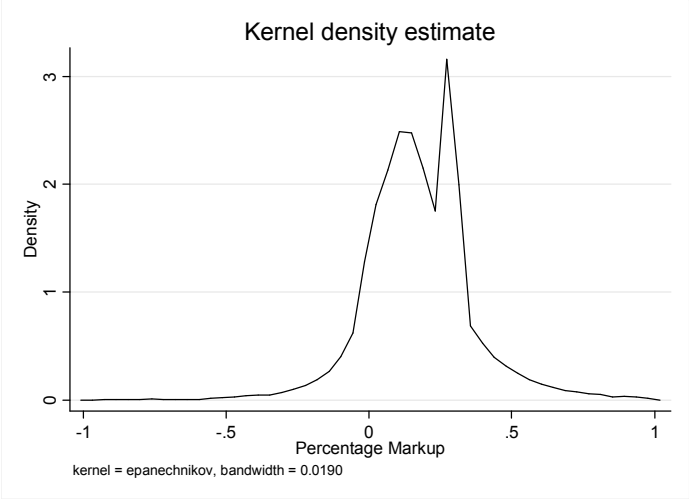
Notes: Robust (clustered) standard errors in parentheses. ***, **, *, 1%, 5%, 10% significance, respectively. Observations 27,262. In all specifications the 8 month of questioning dummies and 2,608 zip code fixed effects were not reported and not included in the reported number of parameters. The reference category for mortgage type is no mortgage, for household type: partners without children, for size:<50, for buildingyear:<1945, for house class: detached, for distance to centre: in centre.

Table 4: Who lives where? Size versus household type

	partners without children	partners with children	partners with children and others	partners with others	single parent with children	single parent with children and with others	other compo sition	single	Total
Size1 (<50 m2)	0.82	0.75	0.01	0.00	0.08	0.00	0.04	0.95	2.65
Size2 (>50 and <=100 m2)	10.15	7.61	0.10	0.06	0.90	0.01	0.29	8.12	27.24
Size3 (>100 and <=150 m2)	14.07	16.24	0.14	0.08	1.18	0.01	0.22	5.24	37.19
Size4 (>150 and <=200 m2)	6.96	9.82	0.09	0.01	0.49	0.01	0.11	1.80	19.31
Size5 (>200 and <=250 m2)	2.51	3.52	0.03	0.01	0.23	0.01	0.04	0.76	7.11
Size6 (>250 and <=300 m2)	1.20	1.84	0.03	0.00	0.06	0.00	0.02	0.37	3.51
Size7 (>300 m2)	1.09	1.36	0.02	0.01	0.11	0.00	0.04	0.36	2.99
Totals	36.81	41.15	0.42	0.17	3.04	0.05	0.77	17.60	100.00

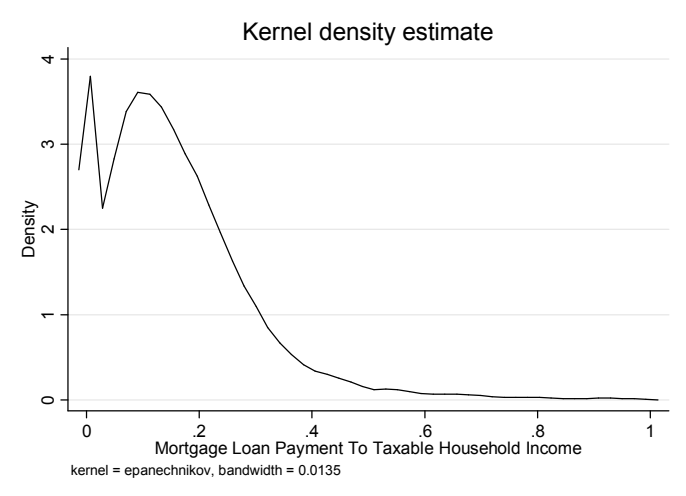
Notes: relative frequencies are reported.

Figure 1: The percentage mark-up



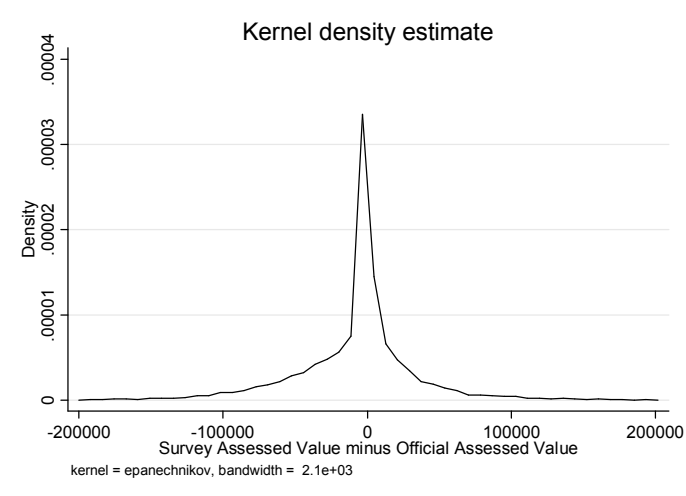
Notes: based on the Epanechnikov kernel. Optimal bandwidth based on minimized mean integrated squared error.

Figure 2: The monthly mortgage payment to taxable household income



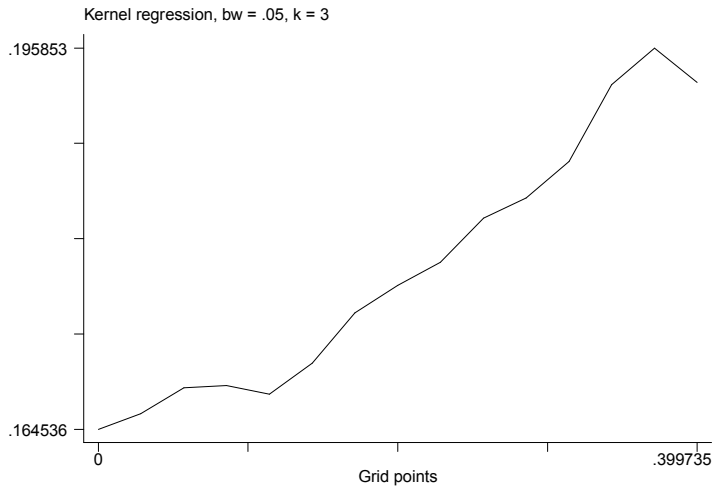
Notes: based on the Epanechnikov kernel. Optimal bandwidth based on minimized mean integrated squared error. The loan-to-income ratio was not allowed to be larger than 1. Negative and zero income were excluded.

Figure 3: The difference between survey values and official values



Notes: based on the Epanechnikov kernel. Optimal bandwidth based on minimized mean integrated squared error. The values were constrained between -200,000 and 200,000.

Figure 4: Kernel regression mark-up on the loan-to-income ratio



Notes: based on the Epanechnikov kernel. Bandwidth 0.05. 15 equally spaced points. A loan-to-income ratio below 0.4 captures most observations (i.e more than 95%). Using the whole range of the loan-to-income results in a highly volatile estimate after 0.4 (resembling a S-curve) due to the low number of observations.