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Financial position and house price determination: An empirical study of income and wealth effects

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ABSTRACT

This paper examines the effect of the relative financial position of buyers and sellers on house prices, distinguishing between income and wealth effects. Using administrative data from the Netherlands (2006–2010) that combine transaction data, house characteristics, and household characteristics of both buyers and sellers, the estimates indicate that a better financial position leads to higher prices for buyers and lower prices for sellers. It provides evidence that income and wealth influence housing market behavior of buyers and sellers. The results are consistent with theories that suggests that higher income and wealth lead to higher search and bargaining costs, implying that households with better financial positions invest less time and effort in search and bargaining leading to worse bargaining outcomes.

1. Introduction

Hedonic models explain prices of heterogeneous goods in terms of differences in characteristics of the good (Rosen, 1974). Therefore, hedonic models are a preferred method in the analysis of house prices (Malpezzi, 2003; Sheppard, 1999). However, after correcting for differences in house characteristics, location, market circumstances, etc. there remains notable heterogeneity in house prices (Harding et al., 2003; Kestens et al., 2006). Both bargaining and search have been suggested as explanations for this heterogeneity. The hedonic bargaining literature suggest that, because house values are not easily determined, bargaining incentives arise within every house transaction (Harding et al., 2003). Investing more effort and time in the bargaining process leads to a better bargaining outcome, ceteris paribus. Search models have the same implications: differences in search costs lead to different search strategies and, therefore, differences in transaction outcomes (Glower et al., 1998; Wheaton, 1990).

As household characteristics are related to search and bargaining, it seems likely that buyer and seller characteristics explain part of the observed price heterogeneity in the housing market. In particular the financial position of a household is likely to affect search and bargaining (Elder et al., 1999; Harding et al., 2003). We will, therefore, focus on the role of household income and wealth in the determination of house prices. It is an empirical issue whether the financial positions of buyers and sellers indeed have an effect on house prices. After correcting for house characteristics, does the financial position of buyers and sellers indeed have an impact on house prices? Are financially well-off and less well-off households located at different sides of the price distribution? That is, can the financial position of buyers and sellers explain part of the heterogeneity in house prices?

The role of buyer and seller characteristics has received relatively little attention in the housing literature as it has been hard to obtain data on both buyers and sellers. Consequently, most empirical studies have limited themselves to either sellers or buyers, while even these studies had to rely on very limited data sets (Kestens et al., 2006; Song, 1995; 1998). To the best of our knowledge, no studies on the role of personal characteristics have included both income and wealth, as data were not available. Therefore, this study is the first to make a distinction between income and wealth effects in a hedonic bargaining framework. We will investigate the relative magnitude and the shape of the relation. Due to both the size of the data set and the extensive seller and

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buyer characteristics the data are particularly well-suited to study the role of financial positions in house price determination.

Understanding how relative financial positions affect house prices will explain buyer and seller behavior in the housing market. The insights in the relationship between financial positions and house prices thus help to unravel the mechanisms in house price determination. This study contributes to the literature on the role of household characteristics in house price determination, in particular to theory related to bargaining and search.

The remainder of this paper is organized as follows. Section 2 presents the theoretical framework. Section 3 discusses the data set and variables. Section 4 describes the empirical model. Section 5 reports the estimates. Section 6 considers the robustness of the results and Section 7 summarizes and concludes.

2. Theoretical framework

Within housing market research two strands of literature exist that explain how (buyer and seller) income and wealth can influence house prices. The first involves search, the second involves bargaining. Nevertheless, these strands of literature are overlapping and not mutually exclusive.

2.1. Search and matching models

Search models explain how similar goods can be sold at different prices due to imperfect information. Continued search leads to a more favorable price, but it comes at the cost of additional search costs. Selling price and selling time are thus determined jointly (Glower et al., 1998). Depending on the search cost there is an optimal search strategy. Most of the housing market search models focus on seller search without paying attention to buyers, i.e. these studies focus on selling time or time-on-the-market only (e.g. Genesove and Mayer, 1997; 2001; Springer, 1996). Sellers will simply accept the first (buyer) offer above their reservation price.

The role of buyers, however, should not be neglected as a transaction involves both seller and buyer search. Price determination in the housing market is a strategic interaction between buyers and sellers (Merlo and Ortalo-Magne, 2004). In search models where both seller and buyer valuations matter, a match occurs if the valuation of the buyer is higher than the valuation of the seller. Matching is the first stage, whereas bargaining over the surplus is the second stage (Wheaton, 1990; Yavaş, 1992). Nevertheless, these theoretical contributions do generally refer to the special case where bargaining power of buyers and sellers is equal. “Since both parties are otherwise identical individuals, it seems reasonable to assume that each has equal bargaining power and that they will split the gains from the transaction” (Wheaton, 1990, p. 1280). Arnold (1999) notes that an equal split is very unlikely as a bargaining outcome depends on buyer and seller discount rates, outside opportunities and the value of the continued search (Arnold, 1999, p. 455).[1]

Buyers and sellers who engage in a transaction are not identical individuals. Sellers and buyers are heterogeneous and have different search costs. They differ, for instance, in their impatience or urgency to make a transaction. More motivated sellers have higher holding costs (search costs) and lower reservation prices. They put less effort in the searching process and sell their houses more quickly at a lower price (Springer, 1996). Impatient buyers, on the other hand, will pay more (Quan and Quigley, 1991).

Search costs are likely to be related to household income and household wealth. Financially unrestrained households are likely to be less patient and more motivated to buy or sell. In other words, households with high incomes and/or wealth have higher search costs. The existence of heterogeneous search costs implies that financially well-off buyers will pay more for a given house, while financially well-off sellers will receive less for a given home. This holds even in matching models in which bargaining power between buyer and seller is assumed to be equal.

It is possible that differences in search costs also lead to differences in the employment of a realtor. Jud (1983), for instance, argues that higher income buyers and sellers – due to higher search costs – are more likely to employ a broker. Based on a sample of house transactions in North Carolina from 1980 he indeed concludes that “higher income buyers were somewhat more likely to consult a broker than others” (Jud, 1983, p. 80). Reasoning along the same lines, Elder et al. (1999) also present evidence that higher income buyers are more likely to use a broker. The use of a real estate agent could mitigate the negative effect of a better financial position on transaction outcome. Still, even if employing a broker does have a mitigating effect it is unlikely to fully offset differences in search costs; effects of financial position on transaction outcomes would thus remain.[2]

2.2. Hedonic bargaining literature

The hedonic bargaining literature explains that prices of heterogeneous goods do not only depend on the characteristics of the good.[3] With pure competition prices are well defined and different people will pay the same price for a given good. However, the more heterogeneous goods are, the thinner markets will become; prices will be less defined and bargaining incentives arise (Harding et al., 2003; Ihlanfeldt and Mayock, 2009; Pennington-Cross, 2004). Bargaining, therefore, can explain why different people pay a different price for a similar house. The housing market is a clear example of a market where bargaining incentives are large. After all, in the margin every house is unique as houses differ in location, characteristics, and quality (Harding et al., 2003). Bargaining power, therefore, affects transaction prices.

The price of a house does not only depend on the house characteristics, but also on the characteristics of the buyer and seller. Empirical studies have found that income has a negative effect on bargaining power. In other words, buyer income increases transaction price, whereas seller income decreases it (Harding et al., 2003; Kestens et al., 2006; Song, 1995; 1998). The explanation is sought for, *a posteriori*, in a framework in which bargaining is costly. Bargaining costs, like search costs, are likely to increase with income and wealth, thereby leading to a negative effect on relative bargaining power.[4]

Harding et al. (2003) suggest that diminishing marginal utility is the likely explanation for a negative effect of financial position on bargaining power: “wealthy individuals demand higher-valued homes but prefer not to expend the time and energy needed to bargain aggressively, and so do worse” (Harding et al., 2003,

[1] Note that in theoretic search models a very narrow definition of bargaining is applied that clearly distinguishes bargaining from search. In the first stage the reservation prices determine whether a transaction can occur (the matching stage) and relatively to these reservation prices one defines bargaining power (the bargaining stage).

[2] See Section 3 for some notes on brokerage in the Netherlands. We will argue that the data used limits heterogeneity due to differences in broker employment. Furthermore, from an international perspective the role of brokers seems to be relatively small in the Netherlands.

[3] We prefer the use of the term hedonic bargaining literature above bargaining literature in order to make a clear distinction with the theoretic bargaining literature that is used in relation to game theory.

[4] In the hedonic bargaining literature a broader definition of bargaining is used than in theoretic search models (or matching models). This broader definition does not distinguish between search and bargaining costs. Bargaining power is not defined relative to the reservation prices of the buyer and seller, but relative to the expected market price.

p. 185).[5] Song (1995; 1998) and Wilhelmsson (2008) refer to search costs to explain negative effects of income on bargaining; Song (1995) explicitly mentions that higher income leads to higher opportunity costs of search. Though the explanations are overlapping they also imply potential differences between the mechanisms underlying income and wealth effects; that is, income is more directly related to time than wealth. In other words, time is constrained and hours worked cannot be used for bargaining or search. Even though we are talking somewhat abstractly about investing 'time and effort' throughout this paper, it could thus be that time is more directly related to income than to wealth.

All in all, both search models and bargaining models explain how income and wealth of buyers and sellers influence house prices. As long as search and/or bargaining costs increase with income and or wealth, both search models and bargaining models imply that a better financial position leads to less search and/or less aggressive bargaining. A better financial position, thus, leads to lower prices for sellers and higher prices for buyers. For the purpose of this analysis we will not distinguish between search and bargaining.

3. Data

3.1. Data set

The Statistics Netherlands (CBS) data set that is used for the analysis in this paper was obtained by combining transactions of existing homes with buyer and seller household characteristics for the period 2006–2010. In the Netherlands transactions of houses are registered by the Cadastre, Land Registry and Mapping Agency (Kadaster). The Cadastre records provide transaction price, transaction month, location, and house type for existing homes. These data have been extended with an extensive set of house characteristics from the Dutch Association of Realtors (NVM), which covers about seventy percent of the market.[6] The house transactions, including house characteristics, have been matched at the individual level to the characteristics of both buyers and sellers. The period under investigation includes both the upturn and the downturn in the Dutch housing market, as prices peaked around August 2008.

The personal characteristics are identified through the household's reference person. The main characteristics are found in the Population Register (GBA). It includes information on birth date, gender, marital status, the number of children, and the number of adults in the household. These characteristics have been further extended with the household's financial data as known by the tax authorities, which include both household income and household wealth. Besides, it provides information on whether a household has significant self-employment income. Again by making use of the household's reference person, additional labor market characteristics have been matched to individuals that are in (salaried) employment. The job characteristics contain information on contract type, that is, full-time/part-time, permanent/temporary, or flexible/fixed.

The house characteristics consist of the lot size (square meters), floor size (square meters), number of rooms, construction period, type of parking lot, garden orientation, insulation, type of heating, type of road the house is located on, the ground lease status, and the interior and the exterior quality. The quality is determined by the broker with a number between 1 and 10. Conditioning on the house characteristics of the Dutch Association of Realtors implies that all the sellers in our data set made use of a seller's agent.[7] While heterogeneity within seller's agents may remain conditioning on the use of seller's agents clearly limits heterogeneity due to brokerage. Buyer's agents have a smaller role in the transaction process. Still we do not observe the extent to which buyers' agents are employed as data is lacking.[8] We will rely on buyer's agent effects to be limited.[9]

The data set thus consists of combined data on house transactions and buyer and seller characteristics that are matched at the individual level. The data set consist of existing family homes (row houses, corner houses, semi-detached houses, and detached houses) that have been sold between 2006 and 2010. Observations of non-private transactions and non-unique addresses have been removed. The remaining Statistics Netherlands data set that is used for the estimations in this paper contains 144,604 observations. Due to both the size and the extensive seller and buyer characteristics the data set is particularly well-suited to study 'bargaining power' in the owner-occupied housing market.

Although the data set is very detailed a limitation does exist: household wealth is not observed entirely. The most important wealth component that is missing is the asset side in endowment mortgages (in Dutch *beleggingshypotheek* and *spaarhypotheek*) as these are not known by the tax authorities. Household wealth excluding mortgage and house value can serve as an alternative wealth variable as it does not have this drawback. We will use this alternative wealth measure in the robustness checks. Apart from that, not all debts from low-income households are observed (mainly short-term debts) nor are assets from current accounts (Statistics Netherlands, 2012, p. 10). The latter entail only minor deviations in wealth.

3.2. Descriptive statistics

As Fig. 1 shows the market conditions in the Dutch housing market have clearly changed between 2006 and 2010. Since the peak in August 2008 the mean house price has shown a significant decrease. The period of rising prices turned into a period of decreasing prices; in our terminology, the housing boom turned into a housing bust. These terms are simply used to refer to the periods of ascending and descending house prices. During the housing market bust the number of transactions has dropped significantly too (see Fig. 2), it has to be noted though that transaction numbers had started dropping well before the prices peaked. Note that the development in average house price is very similar for all types of family homes. The same holds for the number of transactions.

Descriptive statistics of buyer and seller characteristics can be found in Table 1; the differences between them are shown in Table A. 9 in the appendix. We observe that on average buyers are younger (8.8 years), less often married (19.0 percentage points),

[5] Harding et al. (2003) estimate bargaining effects by making use of income, not wealth. Nevertheless, they draw conclusions on wealth, not income. They argue that wealth is "strongly and positively correlated" with income and other observables (Harding et al., 2003, p. 185).

[6] While the NVM realtors have a somewhat larger market share in the core of the Netherlands than in the periphery, there is no indication of any selection effects.

[7] In the Netherlands seller's agents advice on the list price, arrange property showings, help in the negotiation process, and draw up the contract of sale (Overvest and Van der Poel, 2013). From an international perspective, the Dutch commission rates for seller's agents are very low: seller's agents receive only between 1.5 and 2 percent of the transaction price (Delcoure and Miller, 2002).

[8] Making use of survey data of 532 individuals Van der Zeijden et al. (2011) conclude that almost 56 percent of Dutch buyers employed a broker during the period 2008–2011. According to NVM, however, only 18 percent of the buyers employed a buyer's agent in 2009 (Algemeen Dagblad, 2009). The latter percentage is consistent with percentages that have been provided by NVM since (e.g. Dohmen, 2016).

[9] Elder et al. (2000) find no evidence that buyer's agents have an effect on house prices, while they do find that they reduce the search time of buyers. Zietz and Newsome (2002) do not find an effect of buyer's agents on prices for very small and large properties either. However, they do find such an effect for small and medium-sized properties. They also find that buyer's agents do not necessarily act in the best interest of buyers.

Table 1
Buyer and seller characteristics.

	2006		2007		2008		2009		2010	
	Buyer	Seller	Buyer	Seller	Buyer	Seller	Buyer	Seller	Buyer	Seller
Household characteristics:										
Gross income (in euros)	67314	75442	71585	79772	72617	81550	71655	82551	73779	82995
	(42359)	(51589)	(48863)	(58200)	(46020)	(56994)	(42243)	(56433)	(45809)	(56106)
Wealth (in euros)	147461	136487	171185	169360	168170	172119	180486	131028	180752	136586
	(685345)	(649479)	(620134)	(720699)	(646429)	(515319)	(1375832)	(406041)	(1071533)	(479830)
Wealth excl. housing (in euros)	79933	84760	93966	113261	87322	112586	104435	105056	115788	102166
	(456898)	(515558)	(468693)	(577513)	(593735)	(429303)	(1361322)	(340165)	(1050934)	(440454)
Mortgage (in euros)	96190	202827	101650	217703	106685	223586	91161	250254	94740	226181
	(443239)	(400255)	(372188)	(438973)	(175619)	(268088)	(124152)	(229086)	(129830)	(203502)
Multiple adults (1 = yes)	0.823	0.816	0.826	0.813	0.826	0.811	0.812	0.783	0.799	0.755
	(0.382)	(0.387)	(0.379)	(0.390)	(0.379)	(0.392)	(0.391)	(0.413)	(0.401)	(0.430)
Children (1 = yes)	0.440	0.538	0.433	0.532	0.420	0.530	0.374	0.531	0.400	0.502
	(0.496)	(0.499)	(0.495)	(0.499)	(0.494)	(0.499)	(0.484)	(0.499)	(0.490)	(0.500)
Married (1 = yes)	0.455	0.644	0.449	0.636	0.425	0.625	0.385	0.589	0.395	0.566
	(0.498)	(0.479)	(0.497)	(0.481)	(0.494)	(0.484)	(0.487)	(0.492)	(0.489)	(0.496)
Divorced (1 = yes)	0.019	0.033	0.018	0.034	0.018	0.035	0.017	0.031	0.015	0.033
	(0.135)	(0.179)	(0.133)	(0.182)	(0.134)	(0.183)	(0.129)	(0.173)	(0.122)	(0.177)
Self-employed (1 = yes)	0.110	0.131	0.114	0.138	0.117	0.144	0.104	0.142	0.095	0.138
	(0.312)	(0.337)	(0.318)	(0.345)	(0.322)	(0.352)	(0.306)	(0.349)	(0.293)	(0.345)
Characteristics household head:										
Age (in years)	37.7	45.4	37.9	46.0	37.3	46.0	36.1	45.7	36.7	46.5
	(10.6)	(12.7)	(10.8)	(12.9)	(10.8)	(12.9)	(10.6)	(13.0)	(10.7)	(13.4)
Male (1 = yes)	0.899	0.905	0.903	0.905	0.901	0.903	0.892	0.888	0.884	0.885
	(0.301)	(0.293)	(0.296)	(0.293)	(0.298)	(0.296)	(0.310)	(0.316)	(0.320)	(0.319)
Fixed contract (1 = yes)	0.979	0.986	0.976	0.986	0.975	0.984	0.977	0.981	0.978	0.982
	(0.143)	(0.116)	(0.154)	(0.119)	(0.157)	(0.124)	(0.149)	(0.137)	(0.147)	(0.134)
Permanent contract (1 = yes)	0.826	0.836	0.800	0.814	0.812	0.825	0.856	0.852	0.870	0.864
	(0.379)	(0.371)	(0.400)	(0.389)	(0.390)	(0.380)	(0.352)	(0.355)	(0.336)	(0.343)
Full-time contract (1 = yes)	0.913	0.917	0.920	0.923	0.925	0.920	0.925	0.915	0.917	0.912
	(0.281)	(0.276)	(0.271)	(0.267)	(0.263)	(0.271)	(0.264)	(0.278)	(0.276)	(0.283)
House:										
House price (in euros)	261510	261510	275501	275501	279758	279758	265808	265808	267545	267545
	(123568)	(123568)	(137310)	(137310)	(138900)	(138900)	(128143)	(128143)	(128521)	(128521)
Observations	40,509	40,509	37,913	37,913	31,095	31,095	19,845	19,845	15,242	15,242

Notes: Standard deviations are shown under the means. Contract types are conditional on having a job.

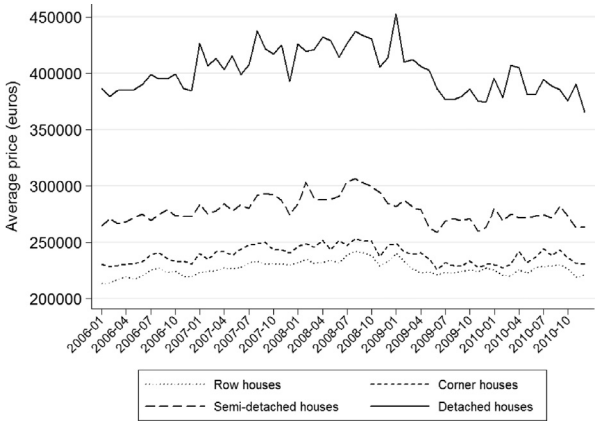

Fig. 1. Average house prices (2006–2010).

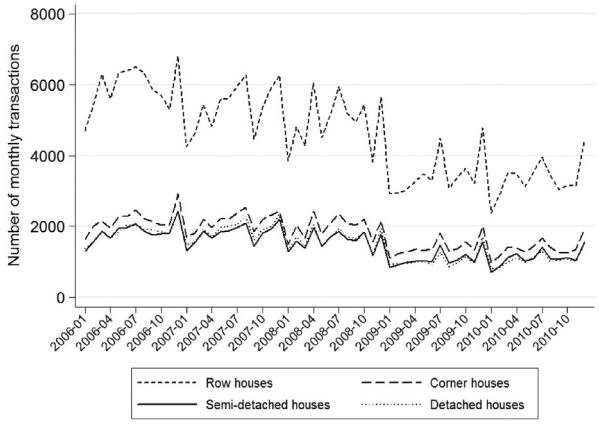

Fig. 2. Housing market transactions (2006–2010).

and less often divorced (1.5 percentage points).[10] Besides, buyers have lower mortgages than sellers (126.0 thousand euros). This holds for all years between 2006–2010. These statistics demonstrate the existence of a housing career. We observe the same for income, as income is on average lower for the buyer household (almost 9.1 thousand euros). Buyers have higher wealth (almost 20.5 thousand euros), even though this is mainly due to the bust years 2009–2010. Note, however, that buyer and seller wealth fluctuate strongly throughout the years. The labor market developments are a little less clear cut even though sellers are more often self-employed and have a fixed contract more often than buyers. These results also hold for the entire period. The summary statistics of the NVM house characteristics can be found in Table A. 10 in the appendix.

Tables 2 and 3 show the main percentiles of buyer and seller income and wealth. Noticeable is the large variation in wealth; particularly seller wealth exhibits a wide distribution, both during the boom and the bust. Table 2 illustrates that overall the median buyer and seller income rose from 2006 to 2010; the median income of households selling a detached house is the main exception. Table 3 shows that median seller wealth increased until 2008 and decreased after that, while median buyer wealth peaked in 2007 or 2008, depending on the house type.

[10] Divorces are defined as a change from a married status to an unmarried status, compared to the year before.

Table 2
Distribution of gross household income.

	Buyer income (in euros)					Seller income (in euros)				
	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
Row houses										
p10	31826	33162	34526	34663	34892	32751	33525	34516	34224	32707
p25	43198	44605	46668	46712	47239	47585	49174	51680	51923	51450
p50	57282	59029	61798	61633	62368.5	66958	69656	72829.5	74865	75442
p75	74587	77132	80598	79775	81425	91899	95639	99432	102928	104704
p90	96367	100270	103629	102395	105369	123180	129063	132542	136246	141407
Obs.	22374	20191	17086	11322	8418	22374	20191	17086	11322	8418
Corner houses										
p10	33075	34080	35220	35218	36106	29907	30651	32713	31501	31314
p25	45104.5	47061	48431	49327.5	49729	46138.5	47290	49567	48821.5	48726
p50	59766.5	62269	64024	65509	65770	66581.5	69770.5	71496.5	73543.5	74808
p75	77683.5	81858	84339	84066.5	85936	91864	97365.5	99281	101585.5	104027
p90	104041	107144	109810	109052	115423	126822	133128	133260	137642	140227
Obs.	7268	7276	5974	3884	2981	7268	7276	5974	3884	2981
Semi-detached houses										
p10	33891	34649	36899	36180.5	37660	27095	27050	28334	28031.5	27653
p25	46754	48475	50797	51556.5	51575	43855	44804	46454	45949	44682
p50	63130.5	66060	67605	68988.5	68561	65434.5	67338	70692	71232.5	71113
p75	84093	89318	91275	91540.5	93179	92188	96703	99445	104206.5	102380
p90	115080	124799	125707	125142	125403	127679	135074	137673	143365	144611
Obs.	6122	5653	4551	2780	2333	6122	5653	4551	2780	2333
Detached houses										
p10	34322	37234	38629	37511	38194.5	22803	23954	23580	24121	22594.5
p25	51387	54430	56202.5	55797	58440	38433	40024	40435	37906	37456
p50	75076	79740	81138	82306	85698	62417	64704	65476.5	63068	61528.5
p75	107804	115677	116848	116381	123102	97288	102331	101960.5	102405	97830
p90	152372	172739	164084	163048	176534.5	146637	155439	152703	151604	148609
Obs.	4745	4793	3484	1859	1510	4745	4793	3484	1859	1510

Note: p10, p25, p50, p75, and p90 are the respective percentiles.

For analysis purposes income, wealth, age, and employment status have been used to create categories. Gross household income has been split up into 10 nominal categories. The reference category is the group with an annual gross household income between 0 and 20,000 euros. Wealth has been used to create 7 nominal wealth categories. The reference category is household wealth smaller than 0 euro, which is a relatively heterogeneous group as it seems to over-represent households that make full use of their fiscal opportunities to limit taxable wealth. Age has been used to generate 9 age classes (reference category: younger than 25 years). Finally, labor market status has been used to generate 8 employment groups (reference category: workers with a flexible, part-time, and temporary contract).

4. Empirical model

Hedonic pricing models have been used extensively to study the housing market (see Malpezzi (2003) and Sheppard (1999) for reviews). Hedonic models focus on the attributes of an object and the corresponding attributes' implicit marginal prices. An object is considered a bundle of attributes; the object's price is given by the sum of the attributes' implicit prices. Pure competition leads to a market equilibrium in which the marginal prices are known by all agents (Rosen, 1974). As the so-called shadow prices are known by both buyers and sellers bargaining does not influence prices.

$$log(P_i) = \alpha Z_i \tag{1}$$

where P_i is the price of house i, α is the vector of shadow prices, and Z_i is the vector of house characteristics.

In thick markets competition is large and prices are well-defined. However, in thin markets prices are less defined and bargaining incentives arise. Therefore, we extend the traditional hedonic model with a bargaining component that captures bargaining relative to the expected market price.

$$log(P_i) = \alpha Z_i + B_i \tag{2}$$

where B_i indicates bargaining between the seller and buyer of house i. Following Harding et al. (2003) we assume that bargaining power, or search for that matter, is a function of personal characteristics.

$$B_i = \beta^{buy} X_i^{buy} + \beta^{sell} X_i^{sell} + \epsilon_b \tag{3}$$

where B_i is bargaining, β is a vector of bargaining coefficients, X_i^{buy} and X_i^{sell} are the vectors of personal characteristics of buyers and sellers respectively, and ϵ_b is a random error term. Substituting Eq. (3) into Eq. (2) results in an extended hedonic model, which expresses the house price in terms of the house characteristics and buyer and seller characteristics (Harding et al., 2003).

$$log(P_i) = \alpha Z_i + \beta^{buy} X_i^{buy} + \beta^{sell} X_i^{sell} + \epsilon_b \tag{4}$$

where P_i is the house price, α is the vector of shadow prices, Z_i is the vector of house characteristics, β is the vector of bargaining coefficients, X_i is a vector of personal characteristics, and ϵ_b is a random error term.

The bargaining power, relative to the market, is thus determined by the personal characteristics of buyers and sellers. While the market conditions and house characteristics determine an expected market price, the buyer and seller traits may result in a bargaining outcome that is either higher or lower. Income and wealth are important buyer and seller characteristics that affect the transaction price in the market for existing homes (Harding et al., 2003).

Different methodologies exist within the study of buyer and seller bargaining power to estimate the effect of personal characteristics. The first approach is based on the assumption that unobserved house characteristics are uncorrelated with the seller and buyer characteristics (Cotteleer et al., 2008; Kestens et al., 2006; Song, 1998). Under the assumption that unobserved house characteristics are uncorrelated with seller and buyer characteristics bargaining effects can simply be estimated from Eq. (4).

Table 3
Distribution of household wealth.

	Buyer wealth (in euros)					Seller wealth (in euros)				
	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
Row houses										
p10	0	565	561	621	20	−87544	−35281	−35375	−145695	−94867
p25	5400	6427	6385	6001	5624	6998	20452	20339	−1483	−3907
p50	35180.5	41415	38115.5	37535	29849.5	69688.5	85308	86400	64608.5	57301
p75	141813	159315	159744	177387	148620	154584	180065	188312	171997	156733
p90	291101	327171	331333	360204	330659	263210	299844	311887	302941	283259
Obs.	22374	20191	17086	11322	8418	22374	20191	17086	11322	8418
Corner houses										
p10	559	754	827	1060	603	−75492	−38900	−34142	−147184	−99827
p25	7803	9437	9753	8724.5	7642	14249	25389.5	24792	2967	−2911
p50	55114.5	59780.5	59188	55585.5	46371	86546	103314	104964	77540.5	68357
p75	172708.5	181994.5	184926	210209	187340	182782.5	212332	213704	199581.5	189389
p90	347484	371026	396667	410284	398076	307786	353782	360803	338562	344919
Obs.	7268	7276	5974	3884	2981	7268	7276	5974	3884	2981
Semi-detached houses										
p10	1075	1604	1750	1749	107	−66375	−15609	−18581	−112842	−66931
p25	17789	20959	20247	15810.5	13791	23551	44475	47271	14831	17421
p50	85567.5	96688	99070	95609.5	79307	115311.5	138961	149564	114821.5	106843
p75	209371	230802	248101	259461	226208	225398	267732	272400	260529	231490
p90	395476	447951	464302	503100.5	454103	373911	445098	447255	436429	406035
Obs.	6122	5653	4551	2780	2333	6122	5653	4551	2780	2333
Detached houses										
p10	4714	8096	7896	7010	3310.5	−47961	−7540	1876	−42598	−40390.5
p25	54551	71071	66660.5	55787	40500	60937	91527	103443	69211	60847
p50	167712	199790	188498.5	197894	156892.5	207536	245656	255023	222609	211141.5
p75	339496	384907	374474.5	413270	388184	375081	418264	438594	412124	388938
p90	623926	738353	675243	790070	799466.5	615581	701845	708165	658048	720129.5
Obs.	4745	4793	3484	1859	1510	4745	4793	3484	1859	1510

Note: p10, p25, p50, p75, and p90 are the respective percentiles.

However, a correlation between unobserved house characteristics and personal characteristics would lead to biased estimates for bargaining. Kestens et al. (2006), for instance, recognize that the omission of luxury house attributes from their model leads to biased estimates for the effect of buyer income on house price if unobserved luxury attributes are correlated with household income.

Harding et al. (2003) start from the premises that buyer and seller characteristics are correlated with unobserved house characteristics. Due to the correlation between unobserved house characteristics and seller and buyer characteristics part of the effects of the unobserved house attributes will be picked up by the seller and buyer traits, resulting in biased estimates for the bargaining effects if equation (4) is estimated. It is, therefore, important to divide house characteristics in observed and unobserved house characteristics, Z_1 and Z_2 respectively, and to formalize the relationship between unobserved house attributes and the seller and buyer characteristics. Note that, for simplicity, the subscripts i have been dropped.

$$\alpha Z = \alpha_1 Z_1 + \alpha_2 Z_2 \tag{5}$$

$$\alpha_2 Z_2 = \delta^{sell} X^{sell} + \delta^{buy} X^{buy} + \epsilon_d \tag{6}$$

where α_1 and α_2 are shadow prices of observed and unobserved house attributes, Z_1 and Z_2 are observed and unobserved house characteristics, δ is a vector of coefficients, X is a vector of personal characteristics, and ϵ_d is a random error term. Substituting Eqs. (5) and (6) into equation (4) results in the following equation:

$$log(P) = \alpha_1 Z_1 + (\beta^{sell} + \delta^{sell}) X^{sell} + (\beta^{buy} + \delta^{buy}) X^{buy} + \epsilon \tag{7}$$

where ϵ is a composite random error term ($\epsilon_b + \epsilon_d$).

It follows directly from Eq. (7) that without further assumptions the bargaining effects cannot be distinguished from the unobserved attributes effects. In order to make identification of the bargaining effect possible (Harding et al., 2003) impose restrictions on the unobserved parameters. More particularly, they "assume that identical buyers and sellers have both similar tastes for housing and similar bargaining power" (Harding et al., 2003, pp. 181–182). In other words, they assume symmetric bargaining power and symmetric demand:

$$\beta^{sell} = -\beta^{buy} \tag{8a}$$

$$\delta^{sell} = \delta^{buy} \tag{8b}$$

The first restriction implies that if buyers and sellers have identical characteristics they will also have identical bargaining power; neither party will have an advantage. The second restriction implies that buyers and sellers with identical characteristics attach the same value to a house. This assumption, consequently, excludes endowment effects, that is, sellers attaching higher values to dwellings simply because they possess them (see Hoffman and Spitzer, 1993; Kahneman et al., 1990). Applying symmetric bargaining power and symmetric demand to Eq. (7) results in the following equation:

$$log(P) = \alpha_1 Z_1 + \beta (X^{sell} - X^{buy}) + \delta (X^{sell} + X^{buy}) + \epsilon \tag{9}$$

The resulting model includes a vector of sums of the seller and buyer attributes and a vector of differences of the seller and buyer attributes. Under the above-mentioned assumptions, the vector of sums identifies the effect of the unobserved house characteristics, called demand effects by Harding et al. (2003) and property class effects by Colwell and Munneke (2006), while the vector of differences identifies the bargaining effect.

Even though we observe an extensive set of house characteristics, it is likely that unobserved house characteristics are correlated with the characteristics of buyers and sellers. We will, therefore, estimate a model including the vector of sums and the vector of differences of seller and buyer characteristics. To allow for a direct effect of market conditions and to allow for local markets a set

of time and municipality dummies is added. In order to allow for different bargaining effects throughout different market conditions the model will be estimated separately for all years. Thus, per year the following model is to be estimated:

$$log(P_{ity}) = \alpha_1 Z_{1ity} + \beta(X_{iy}^{sell} - X_{iy}^{buy}) + \delta(X_{iy}^{sell} + X_{iy}^{buy}) + \sum_{t=2}^{12} \tau_t month_t + \sum_{m=2}^{431} \mu_m munic_m + \epsilon_{it} \quad (10)$$

with $i = 1, \ldots, N; t = 1, .., 12; y = 2006, \ldots, 2010; m = 1, \ldots, 431$ where subscripts *i, t, y*, and *m* indicate the house, month, year, and municipality respectively. α_1 is the effect of observed house characteristics (shadow price of observed characteristics), β is the bargaining effect, δ is the effect of unobserved house characteristics, τ is a time (month) effect, μ is a (fixed) municipality effect, and ϵ_{it} is a random error term.

Note, once more, that the bargaining effects in Eq. (10) are measured relative to the expected market price. Thus, if there is a relative bargaining advantage for sellers in a certain period due to changing demand and supply this will not lead to a change in the bargaining coefficient but a change in the time dummies and/or shadow prices.

5. Estimates

The estimation results can be found in Table 4. The table presents the estimated coefficients of the difference between the seller and buyer characteristics. The coefficients of the observed house characteristics and the sum of the seller and buyer characteristics can be found in Table A. 11 in the appendix. The coefficients of the summed variables behave in line with hedonic theory. House prices rise with summed income and summed wealth. Thus, on average, sellers and buyers that earn more (or have more wealth) live in more expensive homes. House prices also rise with multiple adults and/or children, that is, bigger households live in more expensive homes. The main result regarding employment is that self-employed people live in more expensive homes.

As the convention to subtract buyer characteristics from seller characteristics is followed negative coefficients for the differenced variables represent negative bargaining effects (e.g. Harding et al., 2003, p. 185). The results thus indicate that households with high relative incomes compared to the other party have less bargaining power than households with relatively less income. As a causal interpretation of the coefficients is not possible we will, like Harding et al. (2003) and Colwell and Munneke (2006), refrain from interpreting the coefficients as such.

One can still get an impression of the magnitude of the effects by looking at an example. For instance, a seller with an annual income larger than 100,000 euros who engages in a transaction with a buyer from a different income group (let's say between 40,000 and 50,000 euros) will receive between 5.4 and 7.2 percent less, depending on the year, than a seller with an income between 0 and 20,000 euros who engages in a transaction for an identical house with a buyer with the exact same characteristics.[11] Even though the coefficients cannot be interpreted as a causal effect, the results show that the larger the seller income is compared to the buyer income the less the seller will receive for a given house. F-tests show that the income dummies are jointly significant in all regressions.

The estimated coefficients for differenced wealth show, similarly, that bargaining power decreases with relative wealth. The larger the difference in relative wealth, the worse the households do. However, the effect of wealth is not monotonically decreasing; the effect seems largest for wealth between 100,000 and 200,000 euros. For wealth above 200,000 euros, the highest wealth category, the negative effect is slightly less negative. Still, the results show that higher relative wealth decreases bargaining power. The wealth dummies are jointly significant for all years.[12]

The bargaining coefficients of income and wealth show that these effects hold for all years. There is little evidence that bargaining effects differ between the boom years (2006–2007) and the busts years (2009–2010). All in all, there is clear evidence of negative effects of relative income and wealth on bargaining power in different market conditions. Nevertheless, the wealth effect diminishes for the highest wealth category.

While we do not observe the exact mechanism through which income and wealth influence bargaining outcomes, we have argued that search and bargaining costs drive the investment of time and effort and thereby house prices. By using a proxy for available time we can thus, to a certain extent, look into the underlying mechanism. We use the part-time factor (PTF) of the main job of the households' reference person as the above-mentioned proxy. The PTF indicates the hours worked expressed as a ratio of working fulltime. Although the proxy has clear limitations it seems reasonable to assume that a higher PTF overall indicates that less time remains for bargaining and search.

Table 5 presents the results where the households in salaried employment have been split into two groups based on their PTF. More particularly, the table shows the estimation results separately for PTFs smaller or equal to 0.9 and PTFs above 0.9.[13] The table shows that overall the negative income effect is larger for the group that is working more. Looking at the two highest income categories we observe that except for 2008 the households with PTFs above 0.9 obtain worse bargaining results. It does therefore suggest that the investment of time may indeed play an important role in the income effect. Looking at the highest two wealth categories over the years we find mixed results. The role of time in the wealth effect is thus, as was to be expected, less prominent.

6. Robustness

6.1. Wealth

In order to test for robustness of the results we will estimate a second specification. As noted before, wealth is possibly not observed entirely. Most notably, particular mortgage types may have unobserved components. Results are likely to be biased if the unobserved wealth components are correlated with house or household characteristics. A second issue that needs to be addressed is the possible endogeneity regarding household wealth. After all, house value is a component of household wealth. Nevertheless, given the reference date of wealth this is unlikely to bias results. Household wealth is observed the first of January only, whereas transactions can occur anytime during the year. The negotiated transaction price of a house, therefore, has no direct effect on observed wealth.

Nevertheless, as biases due to these two reasons cannot be excluded we re-estimate the previous model with a second wealth variable, that is, wealth excluding components related to the house. This second wealth variable thus excludes both the house

[11] Realize that we have taken differences of dummy variables. Therefore, the differenced variable can have three values: −1, 0, and 1. For this example we have chosen the easiest possibility: we focus on the differenced variable having value one because the seller is in this particular income group, $Y > 100$, and the buyer is not. Thus, for income group $Y > 100$: $\Delta X = 1$ because $X^{seller} = 1$ and $X^{buyer} = 0$. This is compared to the (excluded) reference category, that is, the seller is in the income group $0 < Y < 20$ and the buyer is not.

[12] Regressions per house type, with calendar dummies for all time periods (2006–2010), corroborate the results mentioned above.

[13] The value of 0.9 has been chosen such that both groups are sufficiently large.

Table 4
Regression results with total wealth.

	2006		2007		2008		2009		2010	
ΔY 20–30	0.007	(0.004)	−0.002	(0.004)	0.002	(0.005)	0.008	(0.006)	0.001	(0.010)
ΔY 30–40	0.009*	(0.004)	0.003	(0.004)	0.005	(0.005)	0.011	(0.006)	0.001	(0.010)
ΔY 40–50	0.002	(0.004)	−0.001	(0.004)	0.001	(0.005)	0.004	(0.006)	−0.003	(0.009)
ΔY 50–60	−0.006	(0.004)	−0.010*	(0.004)	−0.003	(0.005)	−0.008	(0.006)	−0.011	(0.009)
ΔY 60–70	−0.012**	(0.004)	−0.019***	(0.004)	−0.013*	(0.005)	−0.014*	(0.006)	−0.020*	(0.010)
ΔY 70–80	−0.019***	(0.004)	−0.026***	(0.004)	−0.018***	(0.005)	−0.020***	(0.006)	−0.027**	(0.009)
ΔY 80–90	−0.026***	(0.004)	−0.037***	(0.005)	−0.027***	(0.005)	−0.029***	(0.006)	−0.045***	(0.009)
ΔY 90–100	−0.033***	(0.004)	−0.040***	(0.005)	−0.037***	(0.006)	−0.037***	(0.007)	−0.047***	(0.009)
ΔY > 100	−0.054***	(0.004)	−0.063***	(0.005)	−0.059***	(0.005)	−0.057***	(0.006)	−0.072***	(0.010)
ΔW 0–10	0.001	(0.002)	0.004	(0.002)	0.003	(0.003)	0.003	(0.004)	0.010**	(0.003)
ΔW 10–25	−0.006*	(0.002)	−0.005*	(0.002)	−0.005	(0.003)	−0.008*	(0.003)	−0.003	(0.003)
ΔW 25–50	−0.009***	(0.002)	−0.014***	(0.002)	−0.010***	(0.002)	−0.008*	(0.003)	−0.004	(0.004)
ΔW 50–100	−0.015***	(0.002)	−0.018***	(0.002)	−0.015***	(0.003)	−0.017***	(0.004)	−0.007*	(0.003)
ΔW 100–200	−0.018***	(0.002)	−0.020***	(0.002)	−0.019***	(0.002)	−0.016***	(0.003)	−0.012***	(0.003)
ΔW > 200	−0.011***	(0.002)	−0.017***	(0.002)	−0.015***	(0.003)	−0.014***	(0.003)	−0.011***	(0.003)
Δage 25–30	0.004	(0.007)	−0.004	(0.007)	−0.003	(0.008)	−0.012	(0.007)	0.007	(0.014)
Δage 30–35	−0.001	(0.007)	−0.009	(0.007)	−0.004	(0.008)	−0.020**	(0.007)	0.008	(0.014)
Δage 35–40	−0.002	(0.007)	−0.011	(0.007)	−0.010	(0.008)	−0.024**	(0.007)	0.002	(0.014)
Δage 40–45	0.001	(0.007)	−0.011	(0.007)	−0.010	(0.009)	−0.021**	(0.007)	0.001	(0.014)
Δage 45–50	0.001	(0.008)	−0.011	(0.007)	−0.007	(0.009)	−0.021**	(0.008)	0.001	(0.014)
Δage 50–55	−0.002	(0.008)	−0.009	(0.007)	−0.004	(0.009)	−0.022**	(0.008)	0.000	(0.014)
Δage 55–60	−0.005	(0.008)	−0.010	(0.008)	−0.010	(0.009)	−0.025***	(0.007)	0.003	(0.015)
Δage 60–65	−0.008	(0.008)	−0.018*	(0.008)	−0.019*	(0.009)	−0.030**	(0.010)	0.006	(0.015)
Δage > 65	−0.021*	(0.008)	−0.034***	(0.008)	−0.035***	(0.009)	−0.059***	(0.009)	−0.016	(0.016)
Δmale	0.005	(0.002)	0.004	(0.002)	0.001	(0.003)	−0.002	(0.003)	0.007	(0.004)
Δadults	−0.003	(0.002)	−0.003	(0.002)	0.000	(0.002)	0.003	(0.003)	−0.001	(0.003)
Δmarried	−0.006***	(0.002)	−0.006***	(0.002)	−0.007***	(0.002)	−0.003	(0.002)	−0.006***	(0.002)
Δdivorced	0.027***	(0.004)	0.028***	(0.004)	0.024***	(0.005)	0.022***	(0.007)	0.026**	(0.009)
Δchildren	−0.005***	(0.002)	−0.004**	(0.001)	−0.005**	(0.002)	−0.007**	(0.002)	−0.005*	(0.002)
Δfixfulperm	0.003	(0.006)	0.004	(0.007)	−0.013	(0.007)	0.002	(0.010)	0.017	(0.010)
Δflexfulperm	0.024*	(0.010)	0.016	(0.011)	−0.014	(0.011)	−0.015	(0.012)	0.015	(0.017)
Δfixparperm	0.008	(0.007)	0.003	(0.007)	−0.013	(0.008)	0.007	(0.011)	0.025*	(0.011)
Δflexparperm	−0.006	(0.013)	0.019	(0.019)	−0.021	(0.019)	0.032	(0.021)	0.037	(0.025)
Δfixfultemp	0.007	(0.006)	0.007	(0.007)	−0.006	(0.008)	0.003	(0.010)	0.013	(0.011)
Δflexfultemp	0.003	(0.011)	0.015	(0.011)	−0.013	(0.012)	0.019	(0.022)	0.022	(0.017)
Δfixpartemp	0.008	(0.008)	0.007	(0.008)	−0.001	(0.009)	−0.004	(0.012)	0.018	(0.012)
Δselfwithjob	0.002	(0.006)	0.002	(0.007)	−0.012	(0.008)	0.003	(0.011)	0.009	(0.011)
Δselfwithoutjob	0.006	(0.006)	0.006	(0.007)	−0.010	(0.008)	−0.006	(0.010)	0.008	(0.010)
Δjobother	−0.002	(0.006)	0.002	(0.007)	−0.017*	(0.008)	−0.005	(0.010)	−0.000	(0.011)
House characteristics	yes		yes		yes		yes		yes	
Municipality dummies	yes		yes		yes		yes		yes	
Month dummies	yes		yes		yes		yes		yes	
Vector of sums	yes		yes		yes		yes		yes	
Constant	10.942***	(0.059)	11.052***	(0.080)	10.851***	(0.053)	11.234***	(0.110)	10.945***	(0.045)
N	40,509		37,913		31,095		19,845		15,242	
Adj. R-sq	0.852		0.858		0.857		0.844		0.852	

Notes: Dependent variable: log(house price). Robust standard errors clustered by municipality in parentheses. Income (Y) and wealth (W) are measured in thousands of euros. Summed variables and house characteristics can be found in Table A. 11 in the appendix. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

value (subtracted) and the mortgage (added) compared to the earlier applied total wealth. This second wealth definition deals with both earlier mentioned issues as it excludes the net value of house and mortgage for all households and excludes the potential endogeneity.

The estimation results can be found in Table 6. The effects of differenced income and differenced wealth (excluding house related components) are clear. The higher the relative income, compared to the other party, the lower the bargaining power. The use of the alternative wealth variable – that is, wealth excluding house related wealth components – shows that the results are not driven by a bias due to the total wealth variable that was used in the previous estimation. Not only have the effects in this alternative specification the same sign as the previous estimates, overall the income and wealth coefficients also have the same magnitude.[14] The main difference between this specification, which uses wealth excluding housing, and the previous one, which uses total wealth, is that for the years 2007 and 2009 the coefficients of the wealth categories are strictly decreasing.

6.2. Asymmetric bargaining

Asymmetric bargaining could also lead to biased estimates. Consequently, we will relax the symmetric bargaining power assumption that we have made earlier; of main interest are sellers' equity constraints and nominal loss aversion. Even though equity constraints and loss aversion can be interpreted as a rise in bargaining power for sellers, it violates the symmetric bargaining power assumption. Bargaining would no longer be fully symmetric as equity constraints and loss aversion only have an effect on seller bargaining power.

Sellers with equity constraints sell their homes at higher prices on average (Anenberg, 2011; Genesove and Mayer, 1997; 2001). Down-payment constraints are generally given as the explanation for the price effect. In the Netherlands, however, house buyers are not confronted with a formal down-payment requirement on a new house (Dröes and Hassink, 2014); that is, houses can be fi-

[14] At first glance it might seem that the wealth effects, particularly of the higher wealth categories, are less significant. However, the effects relative to the category with wealth lower than 0 euro have only changed because a change within the reference category. Compared to, for instance, wealth between 0 and 10,000 euros the coefficients of the higher wealth categories remain highly significant. We have purposely kept the reference category the same.

Table 5
Regression results split by part-time factor (working more/less than 0.9).

	2006		2007		2008		2009		2010	
	PTF ≤ 0.9	PTF > 0.9	PTF ≤ 0.9	PTF > 0.9	PTF ≤ 0.9	PTF > 0.9	PTF ≤ 0.9	PTF > 0.9	PTF ≤ 0.9	PTF > 0.9
ΔY 20–30	0.004	0.005	−0.005	0.000	−0.009	0.020	0.017	0.031	−0.032	−0.047
ΔY 30–40	0.005	0.004	0.006	−0.000	0.003	0.024*	0.017	0.028	−0.034	−0.047
ΔY 40–50	0.005	−0.005	−0.007	−0.004	−0.003	0.018	0.017	0.020	−0.021	−0.056
ΔY 50–60	−0.008	−0.013	−0.013	−0.015*	0.002	0.010	0.000	0.009	−0.042**	−0.065
ΔY 60–70	−0.014	−0.021*	−0.021	−0.025***	−0.011	−0.001	0.006	−0.002	−0.047**	−0.072
ΔY 70–80	−0.017	−0.028**	−0.033**	−0.030***	−0.013	−0.006	−0.002	−0.009	−0.074***	−0.081
ΔY 80–90	−0.024*	−0.036***	−0.045***	−0.043***	−0.029*	−0.015	−0.025	−0.018	−0.057**	−0.101*
ΔY 90–100	−0.037**	−0.043***	−0.044***	−0.047***	−0.033*	−0.028*	−0.021	−0.028	−0.060**	−0.105*
ΔY > 100	−0.063***	−0.066***	−0.057***	−0.076***	−0.063***	−0.050***	−0.036*	−0.051**	−0.086***	−0.135**
ΔW 0–10	0.000	0.002	−0.002	0.004	−0.019*	0.007	0.008	0.006	0.016	0.009*
ΔW 10–25	−0.006	−0.005	−0.014*	−0.003	−0.003	−0.006*	0.005	−0.009**	0.012	−0.004
ΔW 25–50	−0.009	−0.008**	−0.013*	−0.013***	−0.013	−0.010***	−0.005	−0.009*	0.006	−0.004
ΔW 50–100	−0.012*	−0.016***	−0.023***	−0.018***	−0.027***	−0.013***	−0.004	−0.017***	0.003	−0.008
ΔW 100–200	−0.010*	−0.018***	−0.024***	−0.020***	−0.021**	−0.019***	−0.008	−0.018***	−0.009	−0.013***
ΔW > 200	−0.012*	−0.009***	−0.027***	−0.014***	−0.017*	−0.014***	−0.014	−0.011***	−0.012	−0.008*
House characteristics	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Municipality dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Month dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Vector of sums	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Vector of differences	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Constant	10.924***	10.933***	10.961***	11.077***	10.905***	10.913***	11.122***	11.197***	11.124***	10.822***
N	5,273	29,615	4,980	27,517	3,892	22,888	2,566	14,817	2,092	11,316
Adj. R-sq	0.848	0.856	0.840	0.863	0.853	0.862	0.840	0.845	0.826	0.860

Notes: Dependent variable: log(house price). PTF is the abbreviation of part-time factor; a PTF of one indicates a full-time job. The PTF is based on the main job of the households' reference person. Robust standard errors clustered by municipality in parentheses. Income (Y) and wealth (W) are measured in thousands of euros. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

nanced entirely with borrowed money. Still, negative equity, the value of the house being less than the outstanding mortgage, could lead to institutional constraints and consequently market premiums.

Research has also provided evidence that prospective nominal losses, the nominal house value being less than the original purchase price, leads to market premiums (Anenberg, 2011; Genesove and Mayer, 2001). Households use the original purchase price as a reference point and are reluctant to accept less than they originally paid themselves. Nominal losses thus lead to higher prices for selling households. Genesove and Mayer (2001) and Anenberg (2011) show that price markups can be explained by both equity constraints and loss aversion.

The loan-to-value (LTV) ratio is used as a measure of the equity position of the seller. A low LTV ratio is an indication of a good equity position, while a high LTV ratio is an indication of a poor equity position. An LTV ratio larger than one indicates the existence of negative equity. In the existing literature LTV ratios of 0.8 (80 percent) and 1 (100 percent) have received most attention as it is assumed that 0.8 and 1.0 function as thresholds (Anenberg, 2011; Genesove and Mayer, 1997; 2001). Given that the Dutch institutional setting might be different we do not impose this structure and add higher and lower LTV groups as well.

The existence of a prospective nominal loss is used to identify loss aversion. We measure prospective losses by comparing the regional price index at the time of purchase with the regional price index at the time of (re)sale.[15] We use a dummy variable for the existence of prospective losses as price decreases were limited during the period of investigation. House prices in the Netherlands peaked in August 2008 (CBS StatLine, 2016), implying that even at the regional level we do not observe prospective losses in 2006 and 2007.

The estimation results can be found in Table 7. LTV ratios and prospective losses are only defined for house sellers, indicating that symmetric behavior does not hold here. Even though these estimates show that sellers with high LTV ratios or prospective losses sell their homes at higher prices, it is not possible to conclude whether this is caused by unobserved house characteristics or a price markup. After all, without further assumptions the bargaining effects cannot be distinguished from the so-called demand effects, see Section 4. Still, these results indicate that bargaining might not be entirely symmetric.

The results show that allowing for sellers' equity constraints and loss aversion has virtually no effect on the coefficients of income. However, adding LTV groups and prospective losses for sellers does lead to a more pronounced non-monotonic relation between house prices and wealth. That is, the negative wealth effect is overall largest for wealth between 50,000 and 100,000 euros, while the results show almost no effect anymore for the highest wealth category, wealth above 200,000 euros. The results thus confirm that the larger the difference in relative income, the worse the households do in bargaining. Besides, the estimated wealth effects suggest a U-shaped relation between bargaining power and wealth.

All in all, there is no evidence that the (symmetric) bargaining effects of wealth and income are driven by sellers' equity constraints or loss aversion. Even if we allow for these asymmetries we find convincing evidence that higher relative wealth and/or income deteriorate bargaining power. It seems, however, that bargaining power is not monotonically decreasing in wealth.

6.3. Market conditions

As a minimally arbitrary method to incorporate market conditions we have thus far included month and municipality dummies, and have estimated the regressions separately per year. The latter allows the coefficients to differ freely between years, thereby providing great flexibility for further unobserved market circumstances. Insofar the unobserved characteristics of buyers and sellers differ between years this could also show up in the coefficients of interest. In this section we will extend the analysis by including explicit measures for market conditions.

The choice of good proxies for market conditions is far from clear-cut. Particularly endogeneity is a cause for concern. We con-

[15] We use repeated house sales to estimate monthly prices indices for forty COROP regions. In size these regions are between provinces and municipalities. See Steegmans and Hassink (2015) for details on the methodology.

Table 6
Regression results with wealth excluding housing.

	2006		2007		2008		2009		2010	
ΔY 20–30	0.008*	(0.004)	−0.002	(0.004)	0.002	(0.005)	0.008	(0.006)	0.002	(0.010)
ΔY 30–40	0.009*	(0.004)	0.002	(0.004)	0.006	(0.005)	0.012	(0.006)	0.003	(0.009)
ΔY 40–50	0.003	(0.004)	−0.002	(0.004)	0.001	(0.005)	0.005	(0.006)	−0.001	(0.009)
ΔY 50–60	−0.005	(0.004)	−0.011*	(0.004)	−0.003	(0.005)	−0.007	(0.006)	−0.010	(0.009)
ΔY 60–70	−0.012**	(0.004)	−0.020***	(0.004)	−0.013**	(0.005)	−0.014*	(0.006)	−0.019*	(0.009)
ΔY 70–80	−0.019***	(0.004)	−0.027***	(0.004)	−0.019***	(0.005)	−0.020***	(0.006)	−0.027**	(0.009)
ΔY 80–90	−0.027***	(0.004)	−0.038***	(0.005)	−0.028***	(0.005)	−0.029***	(0.006)	−0.044***	(0.009)
ΔY 90–100	−0.034***	(0.004)	−0.042***	(0.005)	−0.039***	(0.006)	−0.037***	(0.007)	−0.047***	(0.009)
ΔY > 100	−0.057***	(0.004)	−0.065***	(0.005)	−0.061***	(0.005)	−0.059***	(0.006)	−0.072***	(0.010)
ΔW 0–10	0.009***	(0.002)	0.012***	(0.002)	0.001	(0.003)	0.009**	(0.003)	0.004	(0.004)
ΔW 10–25	0.003	(0.003)	0.007**	(0.003)	−0.004	(0.003)	0.002	(0.003)	−0.002	(0.005)
ΔW 25–50	0.000	(0.003)	0.002	(0.003)	−0.009***	(0.003)	0.000	(0.003)	−0.001	(0.005)
ΔW 50–100	−0.003	(0.002)	−0.002	(0.003)	−0.012***	(0.003)	−0.002	(0.004)	−0.006	(0.004)
ΔW 100–200	−0.006*	(0.003)	−0.003	(0.003)	−0.015***	(0.003)	−0.004	(0.004)	−0.016***	(0.004)
ΔW > 200	−0.001	(0.003)	−0.010***	(0.003)	−0.015***	(0.003)	−0.005	(0.004)	−0.012**	(0.004)
Δage 25–30	0.003	(0.007)	−0.006	(0.007)	−0.004	(0.008)	−0.014	(0.007)	0.006	(0.014)
Δage 30–35	−0.003	(0.007)	−0.012	(0.007)	−0.006	(0.008)	−0.023**	(0.007)	0.006	(0.014)
Δage 35–40	−0.004	(0.007)	−0.015*	(0.007)	−0.012	(0.008)	−0.026***	(0.007)	−0.001	(0.014)
Δage 40–45	−0.000	(0.007)	−0.013	(0.007)	−0.011	(0.009)	−0.024**	(0.007)	−0.001	(0.014)
Δage 45–50	0.001	(0.007)	−0.012	(0.007)	−0.007	(0.009)	−0.023**	(0.008)	−0.000	(0.014)
Δage 50–55	−0.001	(0.008)	−0.009	(0.008)	−0.003	(0.010)	−0.024**	(0.008)	−0.000	(0.014)
Δage 55–60	−0.004	(0.008)	−0.010	(0.008)	−0.009	(0.009)	−0.026***	(0.007)	0.004	(0.015)
Δage 60–65	−0.006	(0.008)	−0.017*	(0.008)	−0.018	(0.009)	−0.032***	(0.010)	0.007	(0.015)
Δage > 65	−0.016*	(0.008)	−0.032***	(0.008)	−0.032***	(0.010)	−0.060***	(0.009)	−0.015	(0.016)
Δmale	0.004	(0.002)	0.003	(0.002)	0.001	(0.003)	−0.002	(0.003)	0.006	(0.004)
Δadults	−0.004	(0.002)	−0.004	(0.002)	−0.001	(0.002)	0.002	(0.003)	−0.002	(0.003)
Δmarried	−0.006***	(0.002)	−0.007***	(0.002)	−0.007***	(0.002)	−0.004	(0.002)	−0.006**	(0.002)
Δdivorced	0.028***	(0.004)	0.028***	(0.004)	0.025***	(0.005)	0.023***	(0.007)	0.027**	(0.009)
Δchildren	−0.006***	(0.002)	−0.004**	(0.001)	−0.005***	(0.002)	−0.007**	(0.002)	−0.005*	(0.002)
Δfixfulperm	0.002	(0.006)	0.002	(0.007)	−0.013	(0.007)	0.000	(0.010)	0.016	(0.010)
Δflexfulperm	0.023*	(0.010)	0.014	(0.011)	−0.014	(0.011)	−0.015	(0.012)	0.016	(0.017)
Δfixparperm	0.007	(0.007)	−0.000	(0.007)	−0.014	(0.008)	0.007	(0.011)	0.024*	(0.011)
Δflexparperm	−0.006	(0.013)	0.016	(0.019)	−0.021	(0.019)	0.031	(0.020)	0.031	(0.025)
Δfixfultemp	0.007	(0.006)	0.005	(0.007)	−0.006	(0.008)	0.002	(0.010)	0.012	(0.011)
Δflexfultemp	0.005	(0.011)	0.014	(0.011)	−0.015	(0.012)	0.017	(0.022)	0.022	(0.017)
Δfixpartemp	0.007	(0.008)	0.004	(0.008)	−0.001	(0.009)	−0.005	(0.012)	0.017	(0.012)
Δselfwithjob	0.001	(0.006)	−0.000	(0.007)	−0.013	(0.008)	0.001	(0.011)	0.008	(0.011)
Δselfwithoutjob	0.004	(0.006)	0.003	(0.007)	−0.011	(0.008)	−0.008	(0.010)	0.005	(0.011)
Δjobother	−0.002	(0.006)	0.001	(0.007)	−0.017*	(0.008)	−0.005	(0.010)	−0.002	(0.011)
House characteristics	yes		yes		yes		yes		yes	
Municipality dummies	yes		yes		yes		yes		yes	
Month dummies	yes		yes		yes		yes		yes	
Vector of sums	yes		yes		yes		yes		yes	
Constant	10.931***	(0.059)	11.037***	(0.083)	10.849***	(0.052)	11.254***	(0.107)	10.957***	(0.046)
N	40,509		37,913		31,095		19,845		15,242	
Adj. R-sq	0.852		0.857		0.856		0.844		0.852	

Notes: Dependent variable: log(house price). Robust standard errors clustered by municipality in parentheses. Income (Y) and wealth (W) are measured in thousands of euros. Summed variables and house characteristics can be found in Table A. 12 in the appendix. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

sequently avoid indicators directly based on house prices or the number of transactions. After all, endogeneity is most likely to occur if the previously mentioned proxies are used as we study price effects conditional on the occurrence of a transaction. Instead we will incorporate market circumstances by using proxies for supply and demand; that is, we use the number of listings to proxy supply and internet search behavior to proxy demand.[16]

The number of regional listings have been obtained from the Dutch Association of Realtors (NVM). The listings are used to generate an index that proxies supply; that is, the aggregate number of quarterly listings at the province level has been used to create a regional supply indicator, which has been scaled to start at 100.[17] As suggested by Van Veldhuizen et al. (2016) we use Google search data to proxy demand.[18] More specifically, we use indices of the number of times the word 'funda', the largest housing website in the Netherlands, was searched for at the provincial level (Google Trends, 2006–2010). The indices provide relative data as they are divided by the total number of searches within the region and period (Van Veldhuizen et al., 2016). Besides, the index is scaled to make 100 the maximum.

Table 8 provides the estimates where market conditions have been incorporated through proxies of supply and demand. It shows that while the market proxies are statistically significant they are not economically significant.[19] The estimated coefficients are vir-

[16] We have examined various alternatives to include market conditions explicitly. For instance, we looked into incorporating market conditions by distinguishing 'market liquidity' from 'funding liquidity' as suggested by Brunnermeier and Pedersen (2009); that is, we distinguish the ease with which an asset is traded from the ease with which one can obtain funding for the asset. In this approach the VEH market indicator (Boumeester and Lamain, 2006–2011), which measures consumer confidence in the Dutch owner-occupied housing market (see Boumeester (2014) for details), is used as a proxy for market liquidity. As a proxy for funding liquidity we use the interest rates of newly established mortgages (De Nederlandsche Bank, 2006–2010). However, this approach does not perform better than the supply/demand proxies that we present here.

[17] Quarterly data of the number of listings are used as monthly data were not available. Furthermore, aggregating data at the lower COROP-level does not effect the results.

[18] Van Dijk and Francke (2015) suggest the use of the number of clicks on online listed properties as a proxy for demand. While this proxy has advantages regarding for instance aggregation level, it is not available for the period under investigation.

[19] This also holds if lags of search behavior (1–6 months) are used as a proxy for demand. Combining month dummies and supply/demand proxies renders the latter statistically insignificant.

Table 7
Regression results with total wealth, including seller's LTV and prospective loss.

	2006		2007		2008		2009		2010	
ΔY 20–30	0.008*	(0.004)	−0.002	(0.004)	0.003	(0.005)	0.009	(0.006)	0.001	(0.010)
ΔY 30–40	0.009*	(0.004)	0.004	(0.004)	0.007	(0.005)	0.012	(0.006)	0.001	(0.010)
ΔY 40–50	0.003	(0.004)	−0.000	(0.004)	0.002	(0.005)	0.005	(0.006)	−0.004	(0.010)
ΔY 50–60	−0.006	(0.004)	−0.008	(0.004)	−0.002	(0.005)	−0.009	(0.006)	−0.012	(0.010)
ΔY 60–70	−0.012**	(0.004)	−0.018***	(0.004)	−0.012*	(0.005)	−0.014*	(0.006)	−0.021*	(0.010)
ΔY 70–80	−0.019***	(0.004)	−0.024***	(0.004)	−0.018***	(0.005)	−0.021***	(0.006)	−0.029**	(0.010)
ΔY 80–90	−0.026***	(0.004)	−0.035***	(0.005)	−0.027***	(0.005)	−0.029***	(0.006)	−0.046***	(0.010)
ΔY 90–100	−0.034***	(0.004)	−0.039***	(0.005)	−0.037***	(0.006)	−0.036***	(0.007)	−0.047***	(0.010)
ΔY > 100	−0.054***	(0.004)	−0.062***	(0.005)	−0.059***	(0.005)	−0.058***	(0.006)	−0.073***	(0.010)
ΔW 0–10	0.000	(0.002)	0.003	(0.002)	−0.003	(0.003)	0.001	(0.004)	0.011**	(0.003)
ΔW 10–25	−0.007**	(0.003)	−0.006*	(0.002)	−0.011***	(0.003)	−0.011**	(0.004)	−0.003	(0.004)
ΔW 25–50	−0.010***	(0.002)	−0.015***	(0.002)	−0.014***	(0.003)	−0.009**	(0.003)	−0.003	(0.004)
ΔW 50–100	−0.014***	(0.002)	−0.019***	(0.002)	−0.016***	(0.003)	−0.015***	(0.004)	−0.006	(0.004)
ΔW 100–200	−0.013***	(0.002)	−0.016***	(0.002)	−0.016***	(0.002)	−0.010**	(0.003)	−0.006	(0.004)
ΔW > 200	−0.003	(0.002)	−0.011***	(0.002)	−0.007*	(0.003)	−0.003	(0.003)	0.002	(0.004)
LTV ≤ 0.2	−0.026***	(0.004)	−0.022***	(0.004)	−0.040***	(0.005)	−0.055***	(0.006)	−0.050***	(0.008)
LTV 0.2–0.4	−0.017***	(0.004)	−0.021***	(0.004)	−0.026***	(0.004)	−0.031***	(0.006)	−0.020**	(0.007)
LTV 0.4–0.6	−0.010**	(0.004)	−0.011**	(0.004)	−0.018***	(0.004)	−0.021***	(0.005)	−0.008	(0.006)
LTV 0.6–0.8	−0.001	(0.003)	−0.003	(0.003)	−0.007	(0.004)	−0.012*	(0.005)	0.002	(0.006)
LTV 0.8–1.0	0.008**	(0.003)	0.006*	(0.003)	0.003	(0.004)	0.003	(0.004)	0.009	(0.006)
LTV 1.0–1.2	0.009**	(0.003)	0.011***	(0.003)	0.017***	(0.003)	0.006	(0.004)	0.012**	(0.005)
Prospective loss	0.000	(.)	0.000	(.)	0.017	(0.093)	0.020*	(0.009)	0.020***	(0.006)
House characteristics	yes		yes		yes		yes		yes	
Municipality dummies	yes		yes		yes		yes		yes	
Month dummies	yes		yes		yes		yes		yes	
Vector of sums	yes		yes		yes		yes		yes	
Vector of differences	yes		yes		yes		yes		yes	
Constant	10.945***	(0.063)	11.137***	(0.055)	10.886***	(0.052)	11.270***	(0.111)	10.974***	(0.048)
N	38,321		36,291		29,515		18,871		14,625	
Adj. R-sq	0.853		0.859		0.858		0.845		0.854	

Notes: Dependent variable: log(house price). Robust standard errors clustered by municipality in parentheses. Income (Y) and wealth (W) are measured in thousands of euros. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 8
Regression results with proxies for supply and demand.

	2006	2007	2008	2009	2010
ΔY 20–30	0.007	−0.002	0.002	0.008	0.001
ΔY 30–40	0.008*	0.003	0.005	0.011	0.001
ΔY 40–50	0.002	−0.002	0.001	0.004	−0.003
ΔY 50–60	−0.006	−0.010*	−0.003	−0.007	−0.011
ΔY 60–70	−0.012**	−0.020***	−0.013*	−0.014*	−0.020*
ΔY 70–80	−0.019***	−0.026***	−0.019***	−0.020***	−0.027**
ΔY 80–90	−0.026***	−0.037***	−0.028***	−0.029***	−0.045***
ΔY 90–100	−0.034***	−0.041***	−0.038***	−0.036***	−0.047***
ΔY > 100	−0.054***	−0.064***	−0.060***	−0.057***	−0.073***
ΔW 0–10	0.002	0.005	0.003	0.003	0.010**
ΔW 10–25	−0.005	−0.004	−0.004	−0.009*	−0.003
ΔW 25–50	−0.008***	−0.013***	−0.010***	−0.009**	−0.003
ΔW 50–100	−0.014***	−0.017***	−0.015***	−0.017***	−0.007*
ΔW 100–200	−0.017***	−0.019***	−0.019***	−0.017***	−0.012***
ΔW > 200	−0.009***	−0.016***	−0.014***	−0.015***	−0.011***
Listings index	0.001	0.001***	0.000***	−0.001***	0.000***
Google index	0.001***	0.001***	0.001***	0.000	−0.000
House characteristics	yes	yes	yes	yes	yes
Municipality dummies	yes	yes	yes	yes	yes
Vector of sums	yes	yes	yes	yes	yes
Vector of differences	yes	yes	yes	yes	yes
Constant	10.860***	10.920***	10.746***	11.424***	10.884***
N	40,509	37,913	31,095	19,845	15,242
Adj. R-sq	0.852	0.858	0.857	0.844	0.852

Notes: Dependent variable: log(house price). Robust standard errors clustered by municipality in parentheses. Income (Y) and wealth (W) are measured in thousands of euros. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

tually identical to those presented before. While some alternative proxies are statistically and economically significant none of them affect our findings or lead to a higher R-squared.[20] All things considered, incorporating market conditions through proxies thus does not alter any of our findings.

7. Conclusion

The paper has presented clear evidence that sellers with a good relative financial position receive less for a given house, while buyers with a good relative financial position pay more. After cor-

[20] Apart from those already mentioned we have tested proxies with various regional aggregation levels, used month level observations where available, and included various endogenous transaction number based proxies.

recting for differences in house characteristics, both relative income and relative wealth influence house prices. Bargaining power strictly decreases for higher income categories, whereas the wealth effect subsides for the highest wealth categories. It seems, therefore, that the underlying process that relates income to house price is not entirely the same as that of wealth. All in all, there is clear evidence that the relative financial positions of buyers and sellers explain part of the heterogeneity in house prices. These findings are robust to a variety of specifications.

First, the findings are robust to different market conditions. We have estimated a separate model for every year, thereby allowing for differences between the boom and the bust years. Incorporating market conditions through proxies does not influence our findings either. Our results are thus independent of market conditions and possible changes in the composition of buyers and sellers. Second, the findings are robust to the use of a different wealth variable, which takes into account potential endogeneity of housing wealth and limitations of the administrative wealth data. Third, the findings are robust to an extension allowing for asymmetric bargaining. Following literature on sellers in the housing market we have allowed for equity constraints and loss aversion to influence house prices, thereby loosening the symmetric bargaining assumption we have made.

Throughout the paper we have interpreted the effects of financial position on house prices as a decrease in bargaining power. After all, we have been applying a broad bargaining definition that does not differentiate between search and bargaining. Bargaining power has been studied relative to the expected market price, not relative to the buyer and seller reservation prices. A limitation of our research is that empirically it was not possible to distinguish the bargaining mechanism from the search mechanism. Applying a narrower bargaining definition would have implied the use of additional information on both the search and the bargaining process, which was not available.

The main contribution of the search and matching models, however, would not be the use of a narrower bargaining definition but the possibility to model search and bargaining time. After all, the 'better' bargaining outcome for financially less well-off households is likely to be related to longer periods of search and bargaining. Including data on the time that buyers and sellers spend on search and bargaining could provide important insights into the 'cost' of obtaining a better bargaining outcome.

Future research could also look into the symmetry assumptions that we have been using. However, loosening the symmetric bargaining and symmetric demand assumptions would require data sets that do not only incorporate an extensive set of buyer and seller characteristics but, in addition to this, an even more extensive set of house characteristics than we have used (including particularly luxury attributes). It seems, therefore, that for now limitations to the data remain the bottleneck in bargaining research.

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Appendix A

Table A.9
Difference between seller and buyer characteristics.

	2006	2007	2008	2009	2010
Gross income (in euros)	8127	8187	8933	10896	9216
	(59783)	(67659)	(65774)	(63013)	(64835)
Wealth (in euros)	−10974	−1825	3949	−49458	−44166
	(925209)	(927483)	(807499)	(1421073)	(1129433)
Wealth excl. housing (in euros)	4828	19294	25264	621	−13622
	(674177)	(725902)	(724550)	(1397004)	(1103533)
Mortgage (in euros)	106637	116052	116901	159093	131442
	(592552)	(569265)	(310204)	(247308)	(230520)
Multiple adults (1 = yes)	−0.006	−0.013	−0.016	−0.029	−0.044
	(0.528)	(0.528)	(0.526)	(0.549)	(0.573)
Children (1 = yes)	0.099	0.099	0.110	0.157	0.103
	(0.677)	(0.678)	(0.674)	(0.671)	(0.682)
Married (1 = yes)	0.189	0.187	0.201	0.204	0.171
	(0.660)	(0.655)	(0.658)	(0.659)	(0.666)
Divorced (1 = yes)	0.014	0.016	0.016	0.014	0.017
	(0.223)	(0.226)	(0.226)	(0.216)	(0.216)
Self-employed (1 = yes)	0.021	0.024	0.027	0.037	0.043
	(0.453)	(0.463)	(0.469)	(0.459)	(0.445)
Age (in years)	7.6	8.1	8.6	9.6	9.9
	(14.6)	(14.8)	(14.7)	(14.9)	(15.0)
Male (1 = yes)	0.006	0.002	0.001	−0.004	0.001
	(0.412)	(0.410)	(0.410)	(0.435)	(0.443)
Fixed contract (1 = yes)	0.007	0.011	0.011	0.004	0.005
	(0.185)	(0.194)	(0.201)	(0.201)	(0.195)
Permanent contract (1 = yes)	0.012	0.018	0.014	−0.005	−0.002
	(0.530)	(0.559)	(0.545)	(0.496)	(0.483)
Full-time contract (1 = yes)	0.005	0.004	−0.003	−0.007	−0.001
	(0.392)	(0.377)	(0.373)	(0.382)	(0.394)
Observations	40,509	37,913	31,095	19,845	15,242

Notes: Standard deviations are shown under the means.

Table A.10
House characteristics.

	2006	2007	2008	2009	2010
Transaction price (in euros)	261,510	275,501	279,758	265,808	267,545
	(123,568)	(137,310)	(138,900)	(128,143)	(128,521)
Number of rooms	4.8	4.9	4.9	4.9	5.0
	(1.2)	(1.6)	(1.1)	(1.1)	(1.1)
Lot size (in m^2)	284.7	292.9	281.4	259.1	279.6
	(465.5)	(494.5)	(462.1)	(406.8)	(479.2)
Floor size (in m^2)	132.8	132.9	132.0	129.6	130.1
	(37.1)	(37.5)	(36.0)	(34.0)	(34.8)
Interior quality (range 1–10)	7.2	7.2	7.2	7.2	7.2
	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)
Exterior quality (range 1–10)	7.2	7.2	7.2	7.2	7.2
	(0.8)	(0.8)	(0.7)	(0.7)	(0.8)
Build before 1500 or unknown	0.000	0.000	0.000	0.000	0.000
	(0.020)	(0.010)	(0.014)	(0.010)	(0.000)
Build 1500–1905	0.033	0.032	0.032	0.034	0.034
	(0.179)	(0.176)	(0.177)	(0.181)	(0.181)
Build 1906–1930	0.089	0.088	0.088	0.091	0.087
	(0.285)	(0.283)	(0.283)	(0.287)	(0.282)
Build 1931–1944	0.069	0.067	0.065	0.069	0.072
	(0.254)	(0.250)	(0.246)	(0.254)	(0.259)
Build 1945–1959	0.045	0.050	0.049	0.052	0.055
	(0.208)	(0.218)	(0.217)	(0.222)	(0.228)
Build 1960–1970	0.110	0.112	0.111	0.105	0.110
	(0.313)	(0.315)	(0.315)	(0.307)	(0.313)
Build 1971–1980	0.188	0.185	0.186	0.179	0.183
	(0.391)	(0.388)	(0.389)	(0.383)	(0.387)
Build 1981–1990	0.190	0.193	0.181	0.179	0.178
	(0.392)	(0.394)	(0.385)	(0.383)	(0.383)
Build 1991–2000	0.230	0.220	0.212	0.203	0.188
	(0.421)	(0.414)	(0.409)	(0.402)	(0.391)
Build > 2001	0.044	0.054	0.075	0.088	0.092
	(0.206)	(0.226)	(0.263)	(0.284)	(0.289)
Parking lot	0.047	0.051	0.055	0.055	0.058
	(0.212)	(0.220)	(0.228)	(0.229)	(0.234)
Carport	0.043	0.043	0.041	0.042	0.042
	(0.202)	(0.204)	(0.198)	(0.201)	(0.201)
Garage	0.306	0.305	0.293	0.266	0.280
	(0.461)	(0.460)	(0.455)	(0.442)	(0.449)
Garage & carport	0.023	0.026	0.028	0.026	0.026
	(0.150)	(0.159)	(0.166)	(0.159)	(0.158)
Garage (multi.)	0.031	0.036	0.033	0.028	0.033
	(0.173)	(0.186)	(0.178)	(0.165)	(0.179)
No parking lot	0.550	0.539	0.551	0.583	0.561
	(0.497)	(0.498)	(0.497)	(0.493)	(0.496)
Garden north	0.074	0.078	0.076	0.074	0.071
	(0.262)	(0.268)	(0.266)	(0.261)	(0.256)
Garden north-east	0.070	0.075	0.078	0.079	0.080
	(0.255)	(0.264)	(0.269)	(0.269)	(0.271)
Garden east	0.104	0.103	0.104	0.097	0.104
	(0.305)	(0.305)	(0.306)	(0.296)	(0.305)
Garden south-east	0.107	0.109	0.111	0.120	0.113
	(0.309)	(0.311)	(0.315)	(0.325)	(0.316)
Garden south	0.166	0.165	0.170	0.168	0.160
	(0.372)	(0.371)	(0.375)	(0.374)	(0.367)
Garden south-west	0.131	0.133	0.135	0.145	0.143
	(0.337)	(0.340)	(0.342)	(0.352)	(0.350)
Garden west	0.117	0.119	0.122	0.125	0.122
	(0.321)	(0.324)	(0.327)	(0.330)	(0.328)
Garden north-west	0.075	0.071	0.082	0.084	0.081
	(0.263)	(0.257)	(0.274)	(0.278)	(0.272)
No garden	0.156	0.146	0.121	0.108	0.126
	(0.363)	(0.353)	(0.326)	(0.310)	(0.332)
Insulation	0.862	0.879	0.914	0.928	0.941
	(0.345)	(0.326)	(0.280)	(0.258)	(0.236)
Gas or coal	0.016	0.014	0.011	0.013	0.009
	(0.127)	(0.119)	(0.105)	(0.111)	(0.095)
Central heating	0.960	0.960	0.959	0.964	0.969
	(0.196)	(0.197)	(0.198)	(0.185)	(0.174)
No heating	0.024	0.026	0.030	0.023	0.022
	(0.152)	(0.159)	(0.170)	(0.150)	(0.148)
Quiet road	0.522	0.530	0.525	0.536	0.546
	(0.500)	(0.499)	(0.499)	(0.499)	(0.498)

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Table A.10 (*continued*)

	2006	2007	2008	2009	2010
Busy road	0.023	0.022	0.019	0.015	0.015
	(0.149)	(0.146)	(0.135)	(0.123)	(0.122)
Unknown road	0.455	0.448	0.456	0.448	0.439
	(0.498)	(0.497)	(0.498)	(0.497)	(0.496)
No ground lease	0.842	0.916	0.915	0.920	0.943
	(0.365)	(0.278)	(0.279)	(0.271)	(0.231)
Ground lease	0.021	0.024	0.022	0.026	0.019
	(0.143)	(0.153)	(0.146)	(0.159)	(0.135)
Unknown ground lease	0.137	0.060	0.063	0.054	0.038
	(0.344)	(0.238)	(0.244)	(0.226)	(0.191)
Observations	40,509	37,913	31,095	19,845	15,242

Notes: Ratios are given unless it is mentioned differently. Standard deviations are shown under the means.

Table A.11
Regression results with total wealth.

	2006		2007		2008		2009		2010	
ΣY 20–30	−0.019***	(0.004)	−0.016***	(0.004)	−0.022***	(0.005)	−0.018**	(0.007)	−0.015	(0.009)
ΣY 30–40	−0.006	(0.004)	−0.004	(0.004)	−0.015**	(0.005)	−0.011	(0.006)	0.001	(0.008)
ΣY 40–50	0.007	(0.004)	0.008*	(0.004)	−0.002	(0.005)	0.009	(0.007)	0.010	(0.009)
ΣY 50–60	0.019***	(0.004)	0.020***	(0.004)	0.012*	(0.005)	0.017*	(0.007)	0.027**	(0.009)
ΣY 60–70	0.031***	(0.004)	0.032***	(0.004)	0.021***	(0.005)	0.029***	(0.007)	0.040***	(0.009)
ΣY 70–80	0.044***	(0.004)	0.043***	(0.004)	0.033***	(0.005)	0.040***	(0.007)	0.048***	(0.009)
ΣY 80–90	0.059***	(0.004)	0.058***	(0.005)	0.049***	(0.006)	0.056***	(0.007)	0.055***	(0.010)
ΣY 90–100	0.068***	(0.005)	0.070***	(0.005)	0.061***	(0.006)	0.060***	(0.008)	0.067***	(0.010)
ΣY > 100	0.118***	(0.005)	0.118***	(0.006)	0.106***	(0.006)	0.112***	(0.008)	0.118***	(0.010)
ΣW 0–10	−0.018***	(0.002)	−0.013***	(0.002)	−0.016***	(0.003)	−0.011**	(0.004)	−0.020***	(0.004)
ΣW 10–25	−0.007**	(0.002)	−0.007**	(0.002)	−0.006*	(0.003)	−0.004	(0.003)	−0.018***	(0.004)
ΣW 25–50	−0.001	(0.002)	−0.002	(0.002)	0.001	(0.003)	0.000	(0.003)	−0.012**	(0.004)
ΣW 50–100	0.004	(0.002)	0.005*	(0.002)	0.004	(0.002)	0.008*	(0.003)	−0.006*	(0.003)
ΣW 100–200	0.015***	(0.002)	0.011***	(0.002)	0.014***	(0.003)	0.008**	(0.003)	0.003	(0.003)
ΣW > 200	0.052***	(0.003)	0.046***	(0.003)	0.045***	(0.003)	0.036***	(0.004)	0.035***	(0.004)
Σage 25–30	0.032***	(0.007)	0.020**	(0.007)	0.019*	(0.009)	0.004	(0.007)	0.022	(0.014)
Σage 30–35	0.046***	(0.008)	0.037***	(0.007)	0.036***	(0.009)	0.019**	(0.007)	0.033*	(0.014)
Σage 35–40	0.060***	(0.008)	0.049***	(0.007)	0.046***	(0.009)	0.029***	(0.007)	0.043**	(0.014)
Σage 40–45	0.063***	(0.008)	0.053***	(0.008)	0.049***	(0.009)	0.036***	(0.007)	0.048***	(0.014)
Σage 45–50	0.064***	(0.008)	0.052***	(0.008)	0.050***	(0.009)	0.034***	(0.007)	0.047***	(0.014)
Σage 50–55	0.066***	(0.008)	0.053***	(0.008)	0.044***	(0.009)	0.032***	(0.007)	0.049***	(0.014)
Σage 55–60	0.078***	(0.008)	0.060***	(0.007)	0.061***	(0.010)	0.051***	(0.008)	0.057***	(0.015)
Σage 60–65	0.096***	(0.008)	0.082***	(0.008)	0.077***	(0.010)	0.059***	(0.008)	0.070***	(0.015)
Σage > 65	0.105***	(0.009)	0.092***	(0.009)	0.094***	(0.010)	0.080***	(0.009)	0.096***	(0.015)
Σmale	−0.008***	(0.002)	−0.008**	(0.003)	−0.004	(0.003)	−0.011**	(0.004)	−0.006	(0.004)
Σadults	0.019***	(0.002)	0.018***	(0.002)	0.019***	(0.002)	0.019***	(0.004)	0.016***	(0.004)
Σmarried	0.003	(0.001)	0.004**	(0.001)	0.000	(0.002)	0.001	(0.002)	−0.003	(0.002)
Σdivorced	0.006	(0.003)	0.002	(0.004)	0.003	(0.005)	−0.013*	(0.006)	−0.003	(0.010)
Σchildren	0.008***	(0.001)	0.005***	(0.002)	0.008***	(0.002)	0.010***	(0.002)	0.013***	(0.002)
Σfixfulperm	0.028***	(0.006)	0.018**	(0.006)	0.010	(0.007)	0.037***	(0.010)	0.010	(0.010)
Σflexfulperm	0.026**	(0.009)	0.004	(0.010)	−0.006	(0.010)	0.021	(0.014)	0.001	(0.017)
Σfixparperm	0.032***	(0.007)	0.021**	(0.007)	0.015	(0.008)	0.039***	(0.011)	0.012	(0.011)
Σflexparperm	0.016	(0.015)	0.027	(0.017)	0.001	(0.019)	0.044*	(0.020)	0.012	(0.024)
Σfixfultemp	0.029***	(0.006)	0.020**	(0.006)	0.012	(0.008)	0.038***	(0.010)	0.007	(0.010)
Σflexfultemp	0.026*	(0.011)	0.012	(0.010)	−0.001	(0.012)	0.029	(0.021)	−0.019	(0.017)
Σfixpartemp	0.031***	(0.008)	0.021*	(0.008)	0.020*	(0.009)	0.038**	(0.011)	0.001	(0.012)
Σselfwithjob	0.041***	(0.007)	0.030***	(0.007)	0.019*	(0.008)	0.046***	(0.011)	0.026*	(0.011)
Σselfwithoutjob	0.054***	(0.007)	0.039***	(0.007)	0.027***	(0.008)	0.058***	(0.011)	0.028**	(0.010)
Σjobother	0.037***	(0.007)	0.031***	(0.007)	0.023**	(0.008)	0.049***	(0.011)	0.019	(0.011)
Corner house	0.029***	(0.002)	0.027***	(0.002)	0.029***	(0.003)	0.027***	(0.004)	0.022***	(0.004)
Semi-detached	0.097***	(0.005)	0.100***	(0.006)	0.095***	(0.006)	0.097***	(0.006)	0.081***	(0.007)
Detached	0.211***	(0.008)	0.215***	(0.009)	0.215***	(0.010)	0.199***	(0.011)	0.196***	(0.010)
Number rooms	0.012***	(0.002)	0.006*	(0.003)	0.013***	(0.002)	0.016***	(0.002)	0.015***	(0.002)
Lot size (10 m^2)	0.001***	(0.000)	0.001***	(0.000)	0.001***	(0.000)	0.001***	(0.000)	0.001***	(0.000)
Floor size (10 m^2)	0.035***	(0.001)	0.037***	(0.001)	0.038***	(0.001)	0.039***	(0.001)	0.039***	(0.001)
Interior quality	0.019***	(0.002)	0.018***	(0.002)	0.019***	(0.002)	0.025***	(0.003)	0.024***	(0.003)
Exterior quality	0.011***	(0.002)	0.010***	(0.002)	0.013***	(0.002)	0.009**	(0.003)	0.008*	(0.003)
Build 1500–1905	−0.025	(0.051)	−0.033	(0.077)	0.089*	(0.043)	−0.305**	(0.105)	0.000	(.)
Build 1906–1930	−0.055	(0.052)	−0.055	(0.076)	0.066	(0.040)	−0.321**	(0.105)	−0.017	(0.013)
Build 1931–1944	−0.035	(0.052)	−0.029	(0.076)	0.085*	(0.039)	−0.291**	(0.105)	0.021	(0.014)
Build 1945–1959	−0.067	(0.052)	−0.066	(0.076)	0.046	(0.038)	−0.338**	(0.104)	−0.016	(0.016)
Build 1960–1970	−0.108*	(0.053)	−0.112	(0.076)	−0.007	(0.038)	−0.396***	(0.103)	−0.086***	(0.016)

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Table A.11 (*continued*)

	2006		2007		2008		2009		2010	
Build 1971–1980	−0.103	(0.054)	−0.106	(0.076)	0.000	(0.038)	−0.390***	(0.103)	−0.086***	(0.017)
Build 1981–1990	−0.067	(0.054)	−0.072	(0.076)	0.036	(0.038)	−0.356***	(0.103)	−0.045**	(0.017)
Build 1991–2000	−0.015	(0.055)	−0.022	(0.076)	0.082*	(0.038)	−0.308**	(0.103)	0.003	(0.017)
Build > 2001	0.017	(0.056)	0.008	(0.076)	0.114**	(0.038)	−0.271**	(0.104)	0.035	(0.020)
Parking lot	0.035***	(0.005)	0.032***	(0.004)	0.027***	(0.004)	0.034***	(0.005)	0.024***	(0.005)
Carport	0.052***	(0.005)	0.054***	(0.005)	0.047***	(0.005)	0.043***	(0.005)	0.035***	(0.007)
Garage	0.095***	(0.003)	0.094***	(0.003)	0.091***	(0.003)	0.083***	(0.003)	0.087***	(0.004)
Garage & carport	0.107***	(0.006)	0.102***	(0.006)	0.108***	(0.007)	0.089***	(0.007)	0.084***	(0.010)
Garage (multi.)	0.091***	(0.007)	0.091***	(0.007)	0.081***	(0.008)	0.089***	(0.009)	0.080***	(0.010)
Garden north	−0.023***	(0.004)	−0.016**	(0.005)	−0.010*	(0.005)	−0.010	(0.006)	−0.015*	(0.006)
Garden north-east	−0.019***	(0.004)	−0.015**	(0.005)	−0.010*	(0.004)	−0.014*	(0.006)	−0.016**	(0.006)
Garden east	−0.024***	(0.003)	−0.022***	(0.004)	−0.014**	(0.004)	−0.015**	(0.006)	−0.025***	(0.005)
Garden south-east	−0.020***	(0.004)	−0.015***	(0.004)	−0.007	(0.004)	−0.009	(0.006)	−0.013*	(0.006)
Garden south	−0.017***	(0.003)	−0.009*	(0.004)	−0.009*	(0.004)	−0.012*	(0.005)	−0.010	(0.005)
Garden south-west	−0.012***	(0.004)	−0.013**	(0.004)	−0.004	(0.004)	−0.013*	(0.005)	−0.009	(0.005)
Garden west	−0.022***	(0.004)	−0.018***	(0.005)	−0.012**	(0.004)	−0.009	(0.006)	−0.015**	(0.005)
Garden north-west	−0.019***	(0.004)	−0.012*	(0.005)	−0.010*	(0.004)	−0.006	(0.006)	−0.009	(0.006)
Insulation	−0.000	(0.003)	−0.003	(0.004)	0.000	(0.004)	0.000	(0.005)	0.005	(0.006)
Gas or coal	−0.092***	(0.010)	−0.108***	(0.011)	−0.103***	(0.012)	−0.118***	(0.015)	−0.121***	(0.018)
Central heating	−0.006	(0.006)	−0.003	(0.006)	−0.006	(0.007)	−0.004	(0.010)	−0.012	(0.010)
Quiet road	0.006**	(0.002)	0.007***	(0.002)	0.003	(0.002)	0.005	(0.003)	0.011***	(0.003)
Busy road	−0.012	(0.008)	−0.020*	(0.008)	−0.005	(0.008)	−0.019*	(0.009)	−0.010	(0.013)
No ground lease	−0.005*	(0.003)	−0.011*	(0.005)	−0.007	(0.004)	−0.003	(0.006)	−0.002	(0.009)
Ground lease	−0.048***	(0.014)	−0.054*	(0.022)	−0.051*	(0.022)	−0.061*	(0.027)	−0.067**	(0.026)
N	40,509		37,913		31,095		19,845		15,242	
Adj. R-sq	0.852		0.858		0.857		0.844		0.852	

Notes: Dependent variable: log(house price). Robust standard errors clustered by municipality in parentheses. Income (Y) and wealth (W) are measured in thousands of euros. Differenced variables can be found in Table 4. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.12
Regression results with wealth excluding housing.

	2006		2007		2008		2009		2010	
ΣY 20–30	−0.018***	(0.004)	−0.016***	(0.004)	−0.021***	(0.005)	−0.019**	(0.007)	−0.014	(0.009)
ΣY 30–40	−0.006	(0.004)	−0.004	(0.004)	−0.015**	(0.005)	−0.011	(0.006)	0.002	(0.009)
ΣY 40–50	0.007	(0.004)	0.008	(0.004)	−0.003	(0.005)	0.009	(0.007)	0.011	(0.009)
ΣY 50–60	0.018***	(0.004)	0.019***	(0.004)	0.011*	(0.005)	0.016*	(0.007)	0.028**	(0.009)
ΣY 60–70	0.031***	(0.004)	0.031***	(0.004)	0.021***	(0.005)	0.027***	(0.007)	0.040***	(0.009)
ΣY 70–80	0.043***	(0.004)	0.042***	(0.004)	0.033***	(0.005)	0.039***	(0.007)	0.048***	(0.009)
ΣY 80–90	0.059***	(0.004)	0.058***	(0.005)	0.049***	(0.006)	0.055***	(0.007)	0.056***	(0.010)
ΣY 90–100	0.067***	(0.005)	0.069***	(0.005)	0.061***	(0.006)	0.059***	(0.008)	0.068***	(0.010)
ΣY > 100	0.115***	(0.005)	0.117***	(0.006)	0.104***	(0.006)	0.110***	(0.008)	0.118***	(0.010)
ΣW 0–10	−0.011***	(0.002)	−0.004	(0.002)	−0.017***	(0.003)	−0.006	(0.004)	−0.025***	(0.004)
ΣW 10–25	0.001	(0.002)	0.006*	(0.003)	−0.005	(0.003)	0.007	(0.004)	−0.017***	(0.004)
ΣW 25–50	0.008**	(0.003)	0.014***	(0.003)	0.002	(0.003)	0.009*	(0.004)	−0.010*	(0.004)
ΣW 50–100	0.017***	(0.003)	0.021***	(0.003)	0.008*	(0.003)	0.023***	(0.004)	−0.005	(0.004)
ΣW 100–200	0.027***	(0.003)	0.029***	(0.003)	0.018***	(0.003)	0.020***	(0.005)	−0.000	(0.004)
ΣW > 200	0.062***	(0.004)	0.054***	(0.003)	0.046***	(0.003)	0.045***	(0.005)	0.035***	(0.004)
Σage 25–30	0.031***	(0.007)	0.018*	(0.007)	0.018*	(0.009)	0.003	(0.007)	0.021	(0.014)
Σage 30–35	0.045***	(0.008)	0.034***	(0.007)	0.035***	(0.009)	0.016*	(0.007)	0.030*	(0.014)
Σage 35–40	0.059***	(0.008)	0.046***	(0.008)	0.046***	(0.010)	0.026***	(0.007)	0.040**	(0.014)
Σage 40–45	0.063***	(0.008)	0.051***	(0.008)	0.048***	(0.009)	0.033***	(0.007)	0.045**	(0.014)
Σage 45–50	0.064***	(0.008)	0.050***	(0.008)	0.051***	(0.010)	0.032***	(0.007)	0.045**	(0.014)
Σage 50–55	0.068***	(0.008)	0.053***	(0.008)	0.045***	(0.010)	0.031***	(0.007)	0.047***	(0.014)
Σage 55–60	0.080***	(0.008)	0.061***	(0.008)	0.063***	(0.010)	0.050***	(0.008)	0.056***	(0.015)
Σage 60–65	0.099***	(0.008)	0.083***	(0.008)	0.080***	(0.010)	0.059***	(0.009)	0.069***	(0.015)
Σage > 65	0.110***	(0.009)	0.094***	(0.009)	0.100***	(0.011)	0.080***	(0.009)	0.098***	(0.015)
Σmale	−0.008***	(0.002)	−0.009**	(0.003)	−0.004	(0.003)	−0.011**	(0.004)	−0.007	(0.004)
Σadults	0.019***	(0.002)	0.017***	(0.002)	0.018***	(0.002)	0.018***	(0.004)	0.016***	(0.004)
Σmarried	0.003*	(0.001)	0.005***	(0.001)	0.000	(0.002)	0.001	(0.002)	−0.003	(0.002)
Σdivorced	0.006	(0.003)	0.002	(0.004)	0.004	(0.004)	−0.012*	(0.006)	−0.002	(0.010)
Σchildren	0.008***	(0.001)	0.005***	(0.002)	0.007***	(0.002)	0.009***	(0.002)	0.013***	(0.002)
Σfixfulperm	0.028***	(0.006)	0.017**	(0.006)	0.010	(0.007)	0.035***	(0.010)	0.011	(0.010)
Σflexfulperm	0.025**	(0.009)	0.002	(0.010)	−0.008	(0.010)	0.021	(0.014)	0.002	(0.017)
Σfixparperm	0.032***	(0.007)	0.020**	(0.007)	0.016	(0.008)	0.038***	(0.011)	0.014	(0.011)
Σflexparperm	0.013	(0.015)	0.023	(0.017)	0.001	(0.019)	0.045*	(0.019)	0.012	(0.024)
Σfixfultemp	0.029***	(0.006)	0.019**	(0.006)	0.011	(0.008)	0.036***	(0.010)	0.008	(0.010)

(*continued on next page*)

Table A.12 (*continued*)

	2006		2007		2008		2009		2010	
Σflexfultemp	0.026*	(0.011)	0.011	(0.010)	−0.002	(0.012)	0.026	(0.021)	−0.018	(0.017)
Σfixpartemp	0.031***	(0.008)	0.020*	(0.008)	0.020*	(0.009)	0.037**	(0.011)	0.000	(0.013)
Σselfwithjob	0.040***	(0.007)	0.029***	(0.007)	0.018*	(0.008)	0.043***	(0.011)	0.027*	(0.011)
Σselfwithoutjob	0.052***	(0.007)	0.038***	(0.007)	0.026**	(0.008)	0.055***	(0.011)	0.028**	(0.011)
Σjobother	0.038***	(0.007)	0.031***	(0.007)	0.022**	(0.008)	0.048***	(0.011)	0.021	(0.011)
Corner house	0.030***	(0.002)	0.028***	(0.002)	0.029***	(0.003)	0.027***	(0.004)	0.022***	(0.003)
Semi-detached	0.099***	(0.005)	0.101***	(0.006)	0.097***	(0.006)	0.098***	(0.006)	0.082***	(0.007)
Detached	0.216***	(0.008)	0.220***	(0.009)	0.219***	(0.009)	0.202***	(0.011)	0.199***	(0.010)
Number rooms	0.012***	(0.002)	0.006	(0.003)	0.014***	(0.002)	0.016***	(0.002)	0.015***	(0.002)
Lot size (10 m^2)	0.001***	(0.000)	0.001***	(0.000)	0.001***	(0.000)	0.001***	(0.000)	0.001***	(0.000)
Floor size (10 m^2)	0.035***	(0.001)	0.037***	(0.001)	0.038***	(0.001)	0.039***	(0.001)	0.039***	(0.001)
Interior quality	0.018***	(0.002)	0.018***	(0.002)	0.019***	(0.002)	0.024***	(0.003)	0.024***	(0.003)
Exterior quality	0.011***	(0.002)	0.010***	(0.002)	0.013***	(0.002)	0.009**	(0.003)	0.008*	(0.003)
Build 1500–1905	−0.026	(0.051)	−0.036	(0.080)	0.091*	(0.043)	−0.326**	(0.101)	0.000	(.)
Build 1906–1930	−0.057	(0.052)	−0.058	(0.079)	0.067	(0.039)	−0.342***	(0.101)	−0.017	(0.013)
Build 1931–1944	−0.036	(0.052)	−0.031	(0.079)	0.087*	(0.039)	−0.311**	(0.101)	0.021	(0.014)
Build 1945–1959	−0.068	(0.052)	−0.068	(0.079)	0.047	(0.038)	−0.358***	(0.100)	−0.017	(0.016)
Build 1960–1970	−0.111*	(0.053)	−0.115	(0.079)	−0.006	(0.037)	−0.417***	(0.099)	−0.087***	(0.016)
Build 1971–1980	−0.105	(0.054)	−0.109	(0.079)	0.001	(0.037)	−0.411***	(0.099)	−0.087***	(0.017)
Build 1981–1990	−0.068	(0.054)	−0.075	(0.078)	0.038	(0.037)	−0.377***	(0.099)	−0.046**	(0.017)
Build 1991–2000	−0.015	(0.055)	−0.023	(0.079)	0.085*	(0.037)	−0.329**	(0.099)	0.003	(0.018)
Build > 2001	0.014	(0.056)	0.004	(0.079)	0.115**	(0.038)	−0.292**	(0.100)	0.034	(0.020)
Parking lot	0.035***	(0.005)	0.032***	(0.005)	0.027***	(0.004)	0.033***	(0.005)	0.025***	(0.005)
Carport	0.052***	(0.005)	0.055***	(0.005)	0.048***	(0.005)	0.043***	(0.006)	0.035***	(0.007)
Garage	0.097***	(0.003)	0.097***	(0.003)	0.093***	(0.003)	0.083***	(0.003)	0.089***	(0.004)
Garage & carport	0.110***	(0.007)	0.106***	(0.006)	0.112***	(0.007)	0.091***	(0.007)	0.086***	(0.010)
Garage (multi.)	0.092***	(0.007)	0.093***	(0.007)	0.083***	(0.008)	0.089***	(0.009)	0.084***	(0.009)
Garden north	−0.024***	(0.004)	−0.016**	(0.005)	−0.010*	(0.005)	−0.009	(0.006)	−0.015*	(0.006)
Garden north-east	−0.020***	(0.004)	−0.016**	(0.005)	−0.010*	(0.004)	−0.013*	(0.006)	−0.016**	(0.006)
Garden east	−0.025***	(0.003)	−0.023***	(0.004)	−0.014**	(0.004)	−0.014*	(0.006)	−0.025***	(0.005)
Garden south-east	−0.021***	(0.004)	−0.016***	(0.004)	−0.007	(0.004)	−0.009	(0.006)	−0.013*	(0.006)
Garden south	−0.018***	(0.003)	−0.009*	(0.004)	−0.009*	(0.004)	−0.011*	(0.006)	−0.010*	(0.005)
Garden south-west	−0.013***	(0.004)	−0.014**	(0.004)	−0.004	(0.004)	−0.013*	(0.006)	−0.009	(0.005)
Garden west	−0.023***	(0.004)	−0.019***	(0.005)	−0.011**	(0.004)	−0.008	(0.006)	−0.015**	(0.005)
Garden north-west	−0.020***	(0.004)	−0.012*	(0.005)	−0.010*	(0.004)	−0.005	(0.006)	−0.009	(0.006)
Insulation	−0.001	(0.003)	−0.003	(0.004)	−0.000	(0.004)	−0.000	(0.005)	0.005	(0.006)
Gas or coal	−0.092***	(0.010)	−0.107***	(0.011)	−0.103***	(0.012)	−0.118***	(0.015)	−0.121***	(0.018)
Central heating	−0.006	(0.006)	−0.003	(0.006)	−0.006	(0.006)	−0.005	(0.010)	−0.013	(0.010)
Quiet road	0.006**	(0.002)	0.008***	(0.002)	0.004	(0.002)	0.005	(0.003)	0.011***	(0.003)
Busy road	−0.011	(0.008)	−0.020*	(0.008)	−0.006	(0.008)	−0.019*	(0.009)	−0.011	(0.013)
No ground lease	−0.004	(0.003)	−0.011*	(0.005)	−0.008	(0.004)	−0.003	(0.006)	−0.002	(0.009)
Ground lease	−0.047***	(0.014)	−0.054*	(0.022)	−0.052*	(0.021)	−0.060*	(0.026)	−0.067*	(0.026)
N	40,509		37,913		31,095		19,845		15,242	
Adj. R-sq	0.852		0.857		0.856		0.844		0.852	

Notes: Dependent variable: log(house price). Robust standard errors clustered by municipality in parentheses. Income (Y) and wealth (W) are measured in thousands of euros. Differenced variables can be found in Table 6. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

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