Real Estate Agents, Incentives, and Transaction Prices: Evidence from Switzerland

Thomas Richter and Ruben Seiberlich[1],[2],[3]

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Abstract

Purpose

This paper investigates price uncertainty in private residential real estate transactions and examines how real estate broker selection and incentive structures affect transaction outcomes. Using unique data from a Swiss fintech company supporting property sellers, the paper analyzes divergences between broker valuations, listing prices, and realized sale prices. The objective is to understand the sources of valuation uncertainty better, the role of broker behavior, and whether contract design can improve seller outcomes.

Design/Methodology/Approach

The analysis is based on transaction-level data from a Swiss fintech company that supports private property sellers in the sales process. The dataset includes multiple broker valuations, brokers' proposed prices, valuation model outcomes, listing prices, realized sale prices, and broker incentive schemes. The study employs descriptive statistics, pairwise t-tests, and regression analyses to examine valuation or price dispersion, strategic broker behavior, and the impact of performance-based compensation.

Findings

The results reveal economically and statistically significant differences between brokers' valuations and realized sales prices, highlighting substantial valuation uncertainty in private real estate transactions. This highlights the importance of broker selection. Furthermore, we identify local broker competition as a potential source of price divergence. Moreover, stronger performance-based broker incentives are, within certain ranges, associated with significantly higher sale prices relative to fintech-based valuations.

Practical Implications

The findings suggest that private property sellers should pay attention to broker selection and incentive design. Relying on a single broker valuation can lead to substantial opportunity costs due to undervaluation. Data-driven broker selection and performance-based compensation schemes may help better align broker incentives with seller objectives and improve transaction outcomes. Fintech solutions can help reduce information asymmetries and support more efficient pricing decisions.

Originality/Value

This paper provides novel evidence on valuation uncertainty and broker behavior using unique transaction-level data from a fintech company. It jointly analyzes broker valuations, multiple model-based valuations, realized prices, and incentive schemes within a unified framework. The study contributes to the literature by demonstrating how broker selection, strategic behavior, and contract design interact to shape price outcomes in private real estate transactions.

Introduction

It is widely acknowledged that residential properties in Switzerland are highly heterogeneous, which makes price determination in real estate transactions particularly challenging. This is especially true for private individuals with limited real estate expertise. Pricing typically relies on property valuations, yet the choice of valuation method, the specification of the model, and the estimation of required input parameters all involve uncertainties. As a result, it is not uncommon for different valuation experts to arrive at divergent assessments. In this context, it is often said that property valuation is an art rather than a science (French and Gabrielli, 2004).

To support pricing and sales, sellers frequently turn to real estate brokers. However, brokers' regional market expertise and incentive structures can vary widely, sometimes leading to suboptimal outcomes for the seller. While the explicit costs of engaging a broker are apparent, the opportunity costs of undervaluation are often overlooked. When a property is undervalued, the achieved sales price falls short of the maximum attainable price, resulting in forgone gains for the seller.

Our analysis draws data from the Swiss fintech company Bestag, which provides services to property sellers intending to maximize transaction prices in the residential real estate market. The company implements a set of measures designed to optimize the sales process on behalf of its clients. Specifically, this involves (1) employing a data-analytical approach to identify the most suitable real estate broker, (2) estimating the expected transaction price using multiple valuation models and broker estimates, and (3) restructuring the broker's incentive scheme to achieve stronger alignment with the seller's interests.

Our analysis provides unique insights into the transaction process of private individuals selling residential property. The data allow us to compare three real estate agents' valuations and proposed prices to the outcome of two valuation models and the effective selling prices. Based on this data, we contribute to the literature by (1) shedding light on price uncertainty in private real estate transactions, (2) showing that the selection of real estate brokers matters, (3) confirming that both price uncertainty and strategic behavior of real estate brokers have explanatory power to explain price divergence, and (4) demonstrating that contract incentives help to improve the outcome of the transaction process.

Our descriptive statistics reveal economically meaningful differences between real estate broker valuations, fintech-based valuations, brokers' proposed prices, listing prices, and effective sale prices. Pairwise t-tests confirm that these differences are statistically significant. Together, these findings document a substantial dispersion across valuations and prices in private real estate

transactions in the Swiss market, consistent with a high degree of valuation uncertainty. Moreover, given the significant variation across individual real estate agents, our findings suggest that transaction outcomes differ materially across brokers, indicating that broker choice may play a critical role in practice.

In a first step, we aim to understand the sources of uncertainty better. To do this, we focus on the difference between the minimum and maximum valuations provided by agents for the same property and find that valuation uncertainty varies across market segments and regions. This yields interesting insights into where real estate broker selection is particularly important.

Furthermore, we gather suggestive evidence on whether brokers are unable or unwilling to identify the correct market price and find confirmation of both. The observed divergence can be explained, at least in part, by valuation uncertainty, which we measure through the differences between the results of two hedonic valuation models. However, we also find indications that local competition among brokers contributes to price differentials, suggesting that brokers may exploit their position in local markets with limited competition.

In addition, we observe variation in broker compensation structures. Our data include the share of the sales price above the fintech valuation that brokers receive as a performance-based commission (in percent). The higher this share, the stronger the incentive to achieve a higher sale price. In some cases, the service is used without such incentives, while in others, commissions can reach up to 20 percent. Our results show that the difference between the fintech valuation and the actual sale price increases both statistically and economically significantly with the size of the contractual incentive.

This paper differs from prior research by combining three elements that are usually studied separately: valuation uncertainty, broker selection, and incentive design. While existing studies document information asymmetries, broker agency problems, or the effects of compensation schemes, our dataset allows us to observe several competing broker valuations, model-based valuations, listing prices, realized sale prices, and contract incentives for the same Swiss residential transactions. This unified setting provides suggestive evidence to help disentangle valuation uncertainty from strategic broker behavior, offering initial insights into whether performance-based incentives are associated with higher realized transaction prices. The contribution is therefore both empirical and institutional, focusing on private transactions in Switzerland.

Literature Review

Overall, the academic literature on real estate brokers is fragmented and remains constrained by limited data availability. Despite their significance, real estate brokers remain relatively little understood as market participants from an academic perspective. To situate the present analysis within the literature, two main strands have been identified, whose key findings are briefly outlined below. The first addresses the efficiency of real estate markets and the accuracy of real estate valuations more broadly; the second examines real estate brokers and their influence on private property transactions.

Numerous papers document inefficiencies in real estate markets and, accordingly, the process of finding a price is difficult. Marsh and Zumpano (1988) point out that transaction prices do not necessarily reflect underlying asset values. This inefficiency stems from the non-homogeneous nature of real estate products and the limited, asymmetric, and difficult-to-evaluate information available to market participants. Similarly, the decentralized nature of real estate markets, where complex assets trade infrequently and at high transaction costs, creates thin markets within specific property segments. As a result, transactions typically occur under conditions of imperfect information. Beyond pricing outcomes, recent research shows that informational frictions can also manifest in unequal market access. For example, Pietrzak et al. (2025) provide evidence that otherwise comparable individuals may face systematically different access to housing opportunities, highlighting persistent non-price distortions in residential markets. Garmaise and Moskowitz (2004) demonstrate that market participants respond strategically to information asymmetries, for instance, by favoring properties with extensive income histories and avoiding transactions with more informed counterparties.

Recent research confirms that these inefficiencies persist in contemporary real estate markets and have significant implications for market outcomes. These issues remain part of the research agenda. Pollestad et al. (2026) study uncertainty in automated valuation models and highlight that valuation uncertainty persists even in sophisticated new model generations used in real estate finance. At the same time, Banerjee and Paciorek (2025) show how local norms and regulatory changes influence real estate broker compensation. A recent literature review documents increasing academic coverage of the topic but a still fragmented knowledge base (Ahlenius et al., 2025).

Moreover, a growing body of literature has examined the underlying causes of market inefficiencies and friction. Beyond the informational asymmetries discussed above, some of this disharmony arises from imperfect information processing by market participants. A key strand of this research approaches the issue through the lens of behavioral economics, emphasizing systematic deviations from rational decision-making (see, e.g., Kahneman and Tversky, 2013; Thaler, 1980; Tversky and Kahneman, 1991). Case and Shiller (1989, 1990) were among the first to demonstrate that such behavioral factors play a

significant role in real estate markets, showing that housing prices exhibit momentum and underreaction inconsistent with market efficiency. Since then, an extensive body of literature has developed that investigates specific behavioral biases affecting market participants, including loss aversion, anchoring, and reference dependence (see, e.g., Genesove and Mayer, 2001; Engelhardt, 2003).

Closely linked to the question of whether real estate markets are efficient is the extent to which the valuations of properties offered for sale are subject to uncertainty. As noted in the Introduction, there is a consensus in the academic literature that property prices can only be estimated with a given degree of uncertainty (French and Gabrielli, 2004; Abidoye and Chan, 2017; Abidoye and Chan, 2018; Laurice and Bhattacharya, 2005). This stylized fact remains a defining feature of real estate markets, despite methodological advances, better data availability, and the growing use of artificial intelligence in valuation models (see, e.g., McCluskey et al., 2013; Kok et al., 2017; Tchuente, 2026).

While a sizable portion of the literature, largely due to superior data availability, focuses on REIT valuations, information frictions have also been documented in residential real estate (housing) markets (Pollakowski and Ray, 1997; Capozza and Seguin, 1996; Larsen and Weum, 2008). In this context, Crockett (1982) argues that the absence of price competition among brokers contributed to the development of a large brokerage industry in residential real estate markets.

We contribute to this literature by documenting valuation uncertainty, highlighting differences in property valuations across brokers competing for the same sale, and comparing these with results from valuation models. We also observe the resulting listing prices and, using a novel dataset from the Swiss residential real estate market, confirm these findings. Taken together, the evidence points to potential inefficiencies in market price setting. Additionally, we provide insights into the factors driving these incentives.

The relationship between property sellers and real estate brokers can be analyzed through the lens of the principal–agent problem (Anglin and Arnott, 1991). A central issue arises from the information asymmetry between the seller, who typically lacks professional market expertise, and the broker, who possesses superior knowledge of local market conditions and transaction processes (Rutherford et al., 2005). While the seller's objective is to achieve the highest possible sales price for the property at minimal cost and effort, the broker's incentives are not necessarily aligned. Brokers often seek to secure the mandate, maximize their commission income, and minimize their own effort, which may result in conduct that does not fully reflect the seller's best interests. This misalignment of incentives underscores the potential for inefficiencies in real estate transactions and highlights the importance of carefully designing contractual and incentive structures.

One challenge in the opaque real estate market is that selecting the right broker is both difficult and crucial. Turnbull and Waller (2018) use U.S. data to show that brokers with the largest share of listings in a given region achieve higher sales prices for their clients and sell listed properties more quickly than other brokers. The authors attribute this to a broker's ability to leverage their market presence and to generate positive shopping externalities. Anundsen et al. (2020) document heterogeneity across brokers in Norwegian markets and provide evidence that market participants engage in learning.

A study by Levitt and Syverson (2008) highlights the incentive problems arising from the information asymmetry between buyers and sellers. The authors argue that real estate brokers have an incentive to persuade their clients to sell their homes too quickly and at too low a price. Since brokers retain only a small share of the additional profit, they often sell a property at a price that does not correspond to the optimal outcome for the seller.

This is also demonstrated empirically in this study by comparing the sales prices of comparable houses owned by real estate brokers with those marketed by brokers on behalf of third parties. Indeed, the results show that brokers achieve higher prices (+3.7%) when selling their own properties. Moreover, the study finds that this difference increases with the degree of information asymmetry (Levitt and Syverson, 2008).

There is additional literature showing that misaligned incentives in the brokerage industry lead to inefficient outcomes; for example, rising prices with constant relative compensation can lead to the emergence of too many brokers (see, e.g., Han and Hong, 2011 or Hsieh and Moretti, 2003) and limit search costs.

Complementing this incentive-based view, recent evidence from Switzerland points to broader valuation risks in real estate markets. Extended analyses show that bubble risks differ significantly across regions and vary between asset classes, such as real estate and gold (Küttel et al., 2025; Müller et al., 2023). Together, these findings suggest that pricing inefficiencies cannot be explained by brokerage incentives alone but rather reflect wider market dynamics and inherent uncertainty in asset valuation.

Zorn and Larsen (1986) also demonstrate in a theoretical model that conventional compensation schemes (flat fees and price-dependent commissions) lead to lower sales prices than would be achieved if the interests of the seller (principal) and the broker (agent) were fully aligned. Similarly, Anglin and Arnott (1991) show in their analysis that various characteristics of optimal contracts between sellers and brokers can be derived from theoretical considerations but are not reflected in contracts observed in practice. These findings have been corroborated by numerous studies examining how agency-related factors, such as compensation schemes and dual agency, affect outcomes in

housing markets, including agent effort, sales prices, and time on the market (see, e.g., Miceli, 1991; Yavaş, 1996; Turnbull and Dombrow, 2007).

However, Geltner et al. (1992) demonstrate through simulation studies that incorporating incentive contracts under asymmetric information can be practically challenging and may not necessarily lead to optimal outcomes. Munneke and Yavas (2001) theoretically show that full-commission brokers, who should have better incentives than traditional real estate brokers, do not sell properties at higher prices. Instead, they tend to attract more listings until their selling prices converge to similar levels. They also confirm these findings through an empirical analysis. Chinloy and Winkler (2010) confirm a relationship between employment contract design and working hours and also highlight how contract structure affects real estate brokers' efforts. As the papers mentioned above show, the evidence on the pricing effects of non-standard commission structures is somewhat mixed, a conclusion also reached by Brastow et al. (2012).

The considerations discussed above take as given that a broker is involved in the sales process. A broader question, however, is whether such involvement is beneficial at all. In this context, Larceneux et al. (2015) show that sellers primarily benefit from engaging a broker by reducing the risk of not finding suitable buyers and by saving time. In addition, sellers expect that a broker's transaction management provides security and support during negotiations. Gholipour (2012) provides empirical evidence that a higher number of real estate brokers leads to higher house prices and rents. Such findings suggest that brokers can indeed create added value. There is also evidence that using a broker can reduce search costs and improve matching efficiency between buyers and sellers (Baryla & Zumpano, 1995; Elder et al., 1999; Agarwal et al., 2019). Brastow et al. (2012) state that the use of brokers is generally associated with positive pricing effects.

We contribute to the literature on the efficiency of broker services by showing that incentive schemes matter and by providing evidence that variation in these schemes affects pricing outcomes. The most closely related studies in the literature are those by Levitt and Syverson (2008) and Anundsen et al. (2020). While Levitt and Syverson (2008) compare brokers selling their own homes with those selling clients' homes, we jointly study broker selection and incentive contracts. Anundsen et al. (2020) are mainly concerned with the relationship between listing prices and selling prices, whereas we focus on the role of valuation uncertainty, broker selection, and incentives in explaining transaction outcomes. Using Swiss data, we also provide suggestive evidence that valuation uncertainty and local broker competition are associated with realized selling prices.

Data and Variables

This study is based on a proprietary dataset provided by the Swiss fintech company Bestag, which contains detailed information on 263 completed real estate transactions. Bestag provides intermediary services to private homeowners selling residential real estate and integrates broker selection, property valuation, and contract design into a single service offering.

Before describing the dataset in detail, it is useful to clarify the distinction between valuations and pricing decisions used throughout this paper. We use the term “valuation” to refer to an estimate of a property’s market value, reflecting an assessment of expected transaction prices under prevailing market conditions. By contrast, a “proposed price” (or “proposed listing price”) denotes a strategic pricing recommendation made by a real estate agent, which may incorporate considerations related to securing the mandate, reducing time on the market, or other strategic incentives.

This distinction is necessary for the subsequent analysis, as valuations and proposed prices need not correspond and may reflect different underlying information sets and motivations. Accordingly, the dataset allows us to observe an agent’s market value assessments and its strategic pricing recommendations separately, alongside model-based valuations, listing prices, and realized transaction prices.

In standard transactions, sellers independently select a real estate broker, often with limited information about the broker. However, Bestag centralizes this process by maintaining a proprietary dataset containing detailed information on a broker’s past performance across local markets, including transaction prices and time on the market. Based on this, Bestag identifies high-performing brokers, solicits multiple competing valuations for a given property, and assists in selecting the broker offering the most attractive proposal.

A key element of the brokerage relationship is the contractual compensation structure. Bestag advises clients on contract design to align broker incentives with the seller’s goal of maximizing the transaction price. The contracts typically feature a high marginal remuneration incentive scheme, where brokers receive relatively low compensation for outcomes at or below the estimated valuation, but receive significantly higher compensation for achieving prices above this benchmark. For example, instead of a three percent remuneration, the scheme would offer a CHF 30,000 lump sum for the sale of a property estimated at CHF 1,000,000, with a bonus/penalty of 10 or 15 percent on any deviation between the final sale price and the estimation, which we call a “contract incentive” in this paper.

Property valuation is inherently uncertain, as already documented in the literature, so to mitigate this uncertainty and increase transparency, Bestag combines multiple sources of information. Specifically,

it collects valuations from three competing brokers and complements these with estimates derived from two hedonic pricing models.

By bundling broker selection, valuation, and contract design into a single service, Bestag reduces the informational frictions faced by sellers. In return, clients pay a small additional fee to Bestag alongside the standard broker commission, and the broker cedes a portion of the commission as acquisition costs.

This results in a unique and relatively comprehensive dataset that we can exploit in this article for the purposes of academic research. For each transaction, the dataset includes the effective sales price (effective_sales_price), estimated average market values from two standard hedonic valuation models (avg_hedo_valuation) and valuations and proposed listing prices provided by three different real estate brokers (agentevaluation 1,2,3 and agent_plp 1,2,3)[4] , the average (median) valuation of these three brokers (avg_agentevaluation, median_agent_val) (selected as described above) along with their average suggested listing prices (avg_proposed_price), as well as Bestag's own valuation (Bestag_Valuation) and corresponding listing price (listingprice) derived from the previously mentioned set of infomation. This comprehensive dataset allows us to analyze the price determination process in detail. Using this data, we calculate minimum, maximum, mean, and median price estimates from brokers and different valuation models. Since our primary interest lies in price differences, we compute deviations between these valuations and the observed transaction prices.

In addition, the dataset includes information on various property characteristics, such as year dummies, location (transformed to Geo Dummies, Region Dummies, and a Big City indicator for the analysis), property type (apartment, house, or yield property) used as segment indicators, as well as the applied incentive scheme (contractincentive). These variables enable us to document price differences across valuation models and brokers, identify in which types of properties these discrepancies are most pronounced, and examine whether alternative incentive schemes for brokers lead to higher transaction prices.

Table 1 – Descriptive Statistics, Selected Raw Data

Variable	Q25%	Mean	Median	SD	Q75%
Bestag_Valuation	784000	1336704	1190000	863854	1650000
avg_agentevaluation	765167	1280583	1104067	808399	1564667
median_agent_val	750000	1283966	1102200	810632	1563000
min_agent_val	712500	1186083	1029000	742206	1450000
max_agent_val	807500	1371701	1192000	884484	1670000
avg_proposedprice	796667	1337041	1181667	853615	1610000

[4] Minimum of the three valuations (proposed listing prices) is reported as min_agent_val (min_agent_plp) and maximum as max_agent_val (max_agent_plp).

median_agent_plp	790000	1342864	1190000	850684	1635000
min_agent_plp	747500	1234323	1075000	780136	1490000
max_agent_plp	850000	1433935	1250000	945351	1710000
listingprice	792500	1388289	1250000	911624	1685000
effectivesaleprice	792500	1336022	1150000	879124	1672500
contractincentive	8	8.15	10	4.08	10

Note: The values for some variables are not reported owing to data confidentiality.

Table 1 presents descriptive statistics for the 263 transactions. Focusing on the effective sales price, the properties sold for approximately CHF 1.3 million on average. Comparing the different prices and valuations in Table 1, we observe that while prices are generally close, there are notable differences. Listing prices, effective sales prices, and maximum broker valuations tend to exceed model-based valuations. In contrast, the minimum broker valuations deviate more strongly from these benchmarks, highlighting the degree of valuation dispersion across agents.

Empirical Analysis

Valuation uncertainty and prices

As discussed in the literature review, there has been extensive academic research on differences in valuation uncertainty. Building on this, we exploit the rich information on various valuations and price estimates available in our dataset. As defined in the data section, we distinguish between agents' valuations, which capture estimates of market value, and agents' proposed prices, which reflect strategic pricing recommendations. Table 2 summarizes the most significant differences. We use the valuation provided by the real estate agent with the lowest estimate as the reference point (minus min agent, mma and minus min agent in percent, mma_p).

The results reveal economically significant differences between valuations. Typically, we have estimates from three real estate agents competing to sell the property. On average, the agent with the highest valuation estimates a price that is more than CHF 180,000 above that of the agent with the lowest valuation. More expensive properties at least partially drive this difference, but the median difference still amounts to around CHF 120,000. Comparable discrepancies can be observed between the lowest agent valuations and those produced by the fintech company Bestag, as well as between realized transaction prices and listing prices.

The observed discrepancies are not merely a reflection of elevated housing prices, as indicated by the relative percentage differences. On average, the realized sale price exceeds the lowest agent valuation by 14.4 percent. In contrast, the listing price is approximately 18.6 percent higher, underscoring that the selection of a real estate agent can materially influence transaction outcomes.

Table 2 – Descriptive Statistics Price and Valuation Differences

Variable	25%Q	Mean	Median	SD	75%Q
max_agent_mma	70000	185618.5	120000	220603	230000
Bestag_Valuation_mma	40000	150621.6	97000	203400	192500
effectivesaleprice_mma	31000	149939.2	98022	231930	205500
listingprice_mma	75000	202206.4	141000	257315	240000
Bestag_Valuation_mma_p	4.35	14.26	10.03	26.32	17.42
effectivesaleprice_mma_p	3.50	14.43	10.29	29.16	18.86
listingprice_mma_p	7.54	18.60	13.73	32.23	21.91

Note: The values for some variables are not reported owing to data confidentiality.

These findings are striking for two reasons. First, the real estate agents in this sample were preselected by the fintech company as the three most suitable agents for each property, which implies that a random selection of agents could well result in even larger valuation discrepancies. Second, the previously discussed figures represent only average differences. When examining the

distribution more closely, the data show that for the top 25 percent of properties, the effective sales price is at least 18.86 percent higher than the lowest agent valuation.

As illustrated in Table 2, the standard deviations are relatively large, reflecting considerable variability across properties. To determine whether these differences are statistically significant, we perform pairwise t-tests, which are appropriate given that the comparisons are based on the same set of properties. Table 3 shows the results: The rows and columns represent the various price and valuation measures. At the same time, the corresponding p-values from the t-tests indicate whether the mean differences between these measures are statistically different from zero.

Table 3 – P-values from Pairwise T-tests Comparing Valuation and Price Differences.

	Bestag_Valuation	listingprice	effectivesaleprice	avg_agentevaluation	avg_proposedprice	min_agent_val	max_agent_val	median_agent_val	min_agent_plp	max_agent_plp
listingprice	<0.01									
effectivesaleprice	0.93	<0.01								
avg_agentevaluation	<0.01	<0.01	<0.01							
avg_proposedprice	0.96	<0.01	0.92	<0.01						
min_agent_val	<0.01	<0.01	<0.01	<0.01	<0.01					
max_agent_val	<0.01	0.03	<0.01	<0.01	<0.01	<0.01				
median_agent_val	<0.01	<0.01	<0.01	0.36	<0.01	<0.01	<0.01			
min_agent_plp	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
max_agent_plp	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
median_agent_plp	0.45	<0.01	0.54	<0.01	0.12	<0.01	<0.01	<0.01	<0.01	<0.01

Note: The values for some variables are not reported owing to data confidentiality.

The results confirm the differences observed in Tables 1 and 2. In addition to the economically significant gaps discussed earlier, most of the price differences are also statistically significant, with most tests rejecting equality at the one percent significance level. These findings are consistent with prior research suggesting that real estate markets exhibit substantial price uncertainty. The present results empirically confirm this stylized fact for the Swiss market, thereby providing new evidence that supports the broader literature.

The statistically significant differences also raise important questions regarding their underlying causes. The reviewed literature points to two main explanations. First, brokers face incentive structures that may not be perfectly aligned with those of sellers. Since their compensation depends primarily on

completing transactions, brokers may prefer faster sales at slightly lower prices to exerting additional effort to achieve marginally higher ones, an incentive dynamic that can influence both their valuations and pricing recommendations. Second, the observed price differences between broker valuations and actual transaction outcomes may not necessarily result from intentional or strategic behavior, but rather from the inherent uncertainty surrounding property valuation in real estate markets. The following section examines these potential explanations empirically.

Real estate broker price divergence and valuation uncertainty

To shed more light on the origins of the observed price differences, we estimate a regression model that explains the gap between the minimum and maximum broker valuations (real estate agent valuation difference = RAVD) using two key explanatory variables: a proxy for valuation uncertainty and a proxy for strategic or unethical behavior by real estate agents.

As a proxy for general valuation uncertainty, we use the absolute difference between two market-based valuation models (hedonic models) commonly applied in Switzerland. These models are suitable for this purpose because their developers have no incentive to strategically bias valuations upward or downward, in contrast to agents who may undervalue properties to achieve quicker sales or overvalue them to secure mandates (valuation uncertainty = VU).

As a rough proxy for strategic behavior among real estate agents, we include the local market commission rate (COM). The assumption is that more competition among brokers leads to lower commissions, and we interpret lower commissions as reflecting more competitive local brokerage markets. Under this interpretation, stronger competition limits a broker's scope for strategic valuation behavior.

This interpretation is consistent with the broader literature on intermediary markets, where commissions constitute the price of intermediation services (Di Maggio et al., 2022). More generally, empirical studies of competition frequently rely on price- or margin-based measures, such as the price-cost margin, as indirect indicators of competitive pressure, despite their well-known limitations (Boone, 2008). We extend this intuition to residential real estate brokerage, where commission rates are viewed as being linked to competitive conditions (Barwick and Wong, 2019). However, since the relationship between local commission rates and competitive pressure has not been firmly established empirically, our results should be interpreted as suggestive rather than conclusive.

To identify the factors driving the divergence in broker valuations, we estimate the following regression model:

$$RAVD_i = \alpha + \beta * VU_i + \gamma * COM_i + \sum_{k=1}^{K} \delta_k * Control_{ki} + \varepsilon_i$$

The results of the regression can be interpreted as follows. If the valuation uncertainty hypothesis holds, the coefficient β should be positive, indicating that larger discrepancies among the benchmark valuation models are associated with greater differences in broker estimates. Conversely, if the strategic behavior hypothesis is valid, the coefficient γ should also be positive, suggesting that higher average commission rates (reflecting lower competition among brokers) may create incentives for certain agents to engage in strategic valuation behavior, thereby increasing the divergence between their estimates.

To control for other potential influences, the model includes year fixed effects (Year Dummies) together with controls for property type (Segment Indicators), cantonal fixed effects for all 26 Swiss cantons (Geo Dummies[5]), and large-city exposure (Big City[6]). Given the limited sample size, including dummy variables for all cantons consumes a substantial number of degrees of freedom. Therefore, we also employ broader regional dummies instead of canton fixed effects. We define seven regional dummies (Zurich, Espace Mittelland, Northwestern Switzerland, Lake Geneva Region, Ticino, Eastern Switzerland, and Central Switzerland) according to the definition of the Swiss Federal Statistical Office.[7] These controls aim to mitigate the impact of persistent spatial heterogeneity and institutional and regulatory differences across regions. We estimate five specifications; Table 4 presents the regression results. We estimate two separate univariate regressions, regressing the real estate agent valuation differences on each of the two variables of interest individually (Model1 and Model 2). One regression includes both variables of interest (Model3), and two additional models that include the two variables of interest and additional controls: Model4 contains regional dummies, while Model5 contains cantonal dummies.

Table 4 – Explaining Real Estate Agent Valuation Differences (RAVD)

Variable	Model1	Model2	Model3	Model4	Model5
(Intercept)	16.646**	-17.527**	-20.759**	-6.200	-6.847
	(2.267)	(8.716)	(9.145)	(20.748)	(19.500)
VU	0.889		1.896	0.220	-1.431
	(1.669)		(1.635)	(1.798)	(1.750)
COM		12.079***	12.584***	15.467***	12.950***
		(2.956)	(2.987)	(3.387)	(3.394)
Year Dummies	No	No	No	Yes	Yes
Segment Indicators	No	No	No	Yes	Yes

[5] Note that we have no observations in five cantons and effectively only use 21 cantonal dummies.
[6] We classify the following postal codes in Zurich and Geneva as "Big City" areas: 1200-1209 and 8000-8099.
[7] See Grossregionen und Kantone der Schweiz | Map.

Geo Dummies	No	No	No	No	Yes
Region Dummies	No	No	No	Yes	No
Big City	No	No	No	Yes	Yes
F-Statistic	0.28	16.69***	9.03***	1.916**	3.03***
Adjusted R2	-0.003	0.057	0.058	0.056	0.194
# obs	263	263	263	263	263

Note: Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

The estimated coefficient for valuation uncertainty (VU) is small and statistically insignificant across all model specifications and, in some cases, even switches sign. This finding suggests that divergence between valuation models does not explain the observed differences in real estate agent valuations. By contrast, the local market rate (COM) is statistically significant in all model specifications. This suggests that observed valuation differences among real estate agents are correlated with proxies for strategic behavior, particularly local market conditions, emphasizing the importance of agent selection in private real estate transactions.

Transaction prices and real estate broker incentives

Next, we take a closer look at the relationship between transaction prices and broker incentives. The dataset contains detailed information about the incentive contracts of the real estate brokers. Under these contracts, the broker receives relatively little compensation if the property sells at or below the price that the fintech company Bestag deems appropriate. However, if the property sells above this benchmark price, the contract specifies the share of every additional Swiss franc (CHF) the broker retains as an incentive.

Our objective is to explain the effective sales price as a function of these incentives to understand how incentive structures influence sales outcomes. We include a broad set of control variables to account for price differences occurring from other sources. We use the average hedonic valuation (Hedonic Valuation), which captures all ex-ante value-relevant information, along with the proposed price (Proposed Price) to control for strategic price setting considerations. In addition, we include controls for year fixed effects (Year Dummies), property type (Segment Indicators), cantonal fixed effects (Geo Dummies), and our large-city indicator (Big City) to account for persistent spatial heterogeneity and urban market dynamics that may not be fully reflected in recent hedonic model updates.

$$\text{Effective Sales Price}_i = \alpha + \beta * \text{Incentive}_i + \sum_{k=1}^{K} \delta_k * \text{Control}_{ki} + \varepsilon_i$$

As shown in Table 1 earlier, the contract incentives (CI) have a mean of 8.15 percent and a median of 10 percent, with a standard deviation of 4.08. They often take the value 0 or 10 percent, and only rarely have other values. Consequently, the incentive variable exhibits relatively low variability in our data, making it hard from a statistical perspective to tie variation in sales prices to variation in the contract incentive. As a result, we also estimate a specification that accounts for the quasi-binary nature of the variable by using dummy variables representing contract incentives in certain ranges (MOD2-MOD4). Table 5 presents the results.

Table 5 – Contract Incentive and Effective Sales Price

Variable	Dependent Variable: Effective Sales Price			
	MOD1	**MOD2**	**MOD3**	**MOD4**
CI in %	6.073			
	(2623.402)			
CI ≤ 6		-126224.1**		
		(54298.7)		
6 < CI ≤ 11		-118603.4**		
		(51062.8)		
CI ≤ 7			-122900.7**	
			(54246.5)	
7 < CI ≤ 10			-119700.9**	
			(51039.4)	
CI > 10				120461.4**
				(50573.4)
Hedonic valuation	Yes	Yes	Yes	Yes
Proposed price	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Segment Indicators	Yes	Yes	Yes	Yes
Geo Dummies	Yes	Yes	Yes	Yes
Big city	Yes	Yes	Yes	Yes
F-Statistic	281.2***	278.5***	278.4***	288.3***
Adjusted R2	0.972	0.972	0.972	0.972
# obs	263	263	263	263

Note: Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

We use alternative range definitions to understand the underlying dynamics better and assess the robustness of the results. In specification (1), the contract incentive expressed as a percentage shows no statistically significant effect on sales prices. However, detecting an effect here is challenging, as there is very little variation in the incentive. Moreover, differences in property size and potential nonlinearities in the effort required to sell a property may make incentives appear more attractive for higher-priced properties.

Models (2) to (4) use dummy variables for the incentive ranges. Model (2) distinguishes between three ranges of incentives: 0-6 percent, 6-11 percent, and above 11 percent, with the latter serving as the reference category. The results show that properties sold with higher incentives (relative to the reference category) achieve significantly higher prices. Model (3) adjusts the range definitions (below 7%, 7-10%, and above 10%) and yields a similar pattern. Simplifying the model further by defining only one cutoff produces consistent results, since Model (4) indicates that an incentive larger than 10 percent is associated with a statistically significant higher sales price.

Time on the market is also considered a potentially relevant control variable (Björklund et al., 2006), but owing to missing values, we could not include this in our main analysis.[8] The adjusted R^2 is very high in all specifications because we control for the proposed price as well as the hedonic valuations, which are closely related to the effective sales price. Overall, our findings on the relationship between incentives and the effective sales price are consistent. While the incentive in Model 1 is not statistically significant due to a lack of exogenous variation, higher incentives are linked to an increase in the effective sales price in specifications (2) through (4).

Since we have only 263 observations, including dummy variables for all cantons would consume a substantial number of degrees of freedom and might reduce estimation precision. In Table 6, we therefore replace cantonal dummies with regional dummies (MOD1a–MOD4a), which capture broader geographic differences while preserving statistical power. We additionally estimate models that exclude geographic fixed effects altogether (MOD1b–MOD4b) as a further robustness check.

Table 6 – Robustness Contract Incentive and Effective Sales Price

	Regional Dummies instead of Cantonal Dummies				Without Cantonal Dummies			
Variable	**MOD1a**	**MOD2a**	**MOD3a**	**MOD4a**	**MOD1b**	**MOD2b**	**MOD3b**	**MOD4b**
CI in %	952.633				1438.551			
	(2541.296)				(2308.751)			
CI ≤ 6		-110677.5**				-115711.1**		
		(52700.2)				(51988.7)		
6 < CI ≤ 11		-86268.4*				-91536.3*		
		(49535.4)				(49537.8)		
CI ≤ 7			-106452.9**				-114331.6**	
			(52675.3)				(51927.1)	
7 < CI ≤ 10			-87723.1*				-91939.7*	
			(49553.2)				(49552.5)	
CI > 10				92272.2*				97902.9**
				(49138.5)				(49179.4)
Hedonic valuation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Proposed price	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

[8] In unreported analysis, we also estimated models (1) to (4), including the variable time on market. However, explanatory power increases only marginally. Moreover, the number of observations drops sharply from 263 to 161 due to missing data. Differences in estimates, therefore, may reflect sample selection rather than genuine model improvements. Our main findings are qualitatively the same; the results are available on request.

	Regional Dummies instead of Cantonal Dummies				Without Cantonal Dummies			
Variable	**MOD1a**	**MOD2a**	**MOD3a**	**MOD4a**	**MOD1b**	**MOD2b**	**MOD3b**	**MOD4b**
Segment Indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geo Dummies	No	No	No	No	No	No	No	No
Region Dummies	Yes	Yes	Yes	Yes	No	No	No	No
Big city	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-statistic	491.54***	472.23***	471.49***	498.54***	724.39***	678.88***	678.49***	735.03***
Adjusted R^2	0.971	0.972	0.972	0.972	0.971	0.971	0.971	0.971
# obs	263	263	263	263	263	263	263	263

Overall, the results in Table 6 confirm the findings of the main models reported in Table 5. While the continuous incentive measure remains positive but statistically insignificant, the categorical specifications consistently indicate that properties with lower incentive levels are associated with significantly lower transaction prices relative to the reference category. In contrast, the highest incentive category exhibits a positive and statistically significant premium. Both the magnitude and statistical significance of the estimated coefficients change only marginally, indicating that the main findings are robust to alternative geographic controls and model specifications.

Conclusion and Outlook

This study investigates price determination and valuation uncertainty in the Swiss private real estate market using a unique dataset provided by a fintech company that collaborates with property sellers and real estate brokers. Our analysis reveals substantial economic and statistical differences across various price and valuation measures, namely, broker valuations, fintech valuations, listing prices, and realized transaction prices. Pairwise t-tests confirm that these discrepancies are statistically significant, reinforcing earlier evidence that property valuation in real estate markets remains subject to considerable uncertainty. While the analysis reveals robust and economically meaningful associations, the results should be interpreted as correlational rather than strictly causal, given the observational nature of the data.

First, our results confirm the presence of high valuation uncertainty and substantial dispersion in price estimates across agents, even within a preselected pool of top-performing brokers. The magnitude of these differences underscores the inherent challenges of property valuation and the persistent inefficiencies in real estate markets.

Second, by exploring potential drivers of valuation differences, we shed light on the mechanisms behind these discrepancies. The regression analysis indicates that valuation uncertainty alone does not explain the observed variation between broker estimates. Instead, the results suggest that strategic behavior among brokers, influenced by local market conditions and competitive pressure, plays a significant role.

Finally, we examine the relationship between broker incentive structures and transaction outcomes. While the evidence is somewhat mixed, we find a generally positive association between performance-based incentives and achieved sales prices, implying that well-designed compensation schemes can improve alignment between broker and seller interests.

This paper contributes to the literature by providing novel empirical evidence from the underexplored Swiss residential market, focusing on private real estate transactions rather than institutional ones. It uniquely compares multiple broker valuations with standardized model-based estimates for the same properties, enabling a direct assessment of valuation uncertainty. Furthermore, it enhances understanding of broker behavior by distinguishing between valuation uncertainty and strategic behavior as key drivers of price divergence.

This study has faced several limitations. Our dataset, while rich in detail, is relatively small and limited to a selection of brokers, which may restrict generalizability. Moreover, the analysis does not fully capture every factor that could influence broker behavior, such as reputation effects, risk preferences, or client characteristics. Additionally, some of our variables are imperfectly measured; for example, the local market rate may also differ for reasons other than competition. Future research could extend this analysis to larger and more diverse samples, examine temporal dynamics in broker pricing behavior, or explore how digital platforms and fintech innovations reshape the valuation process.

Our findings have several important implications, particularly for sellers in residential real estate markets. First, both the academic literature and our results suggest that broker selection matters. Sellers may therefore benefit from investing time in identifying high-quality brokers or using specialized broker selection services. Second, broker incentives are not necessarily aligned with those of property sellers. This highlights that appropriate incentive design may help align broker performance more closely with seller objectives. However, while desirable in theory, this is not always easy to achieve in practice. Third, the valuation of residential real estate is inherently uncertain. Our results suggest that it is beneficial to consider a broad set of valuations rather than relying on a single estimate from a single broker. This has become increasingly feasible with the availability of automated valuation tools, such as hedonic pricing models, which are widely accessible in markets such as Switzerland.

Our findings also have implications for brokers, since brokers with impressive performance records would benefit from making this fact clear to clients. At the same time, increasing data availability is making broker performance more observable, thereby intensifying competition. Brokers may need to adapt by using data-driven tools themselves, including valuation technologies, to remain competitive and relevant.

Finally, our results have important implications for regulatory authorities concerned with market transparency and efficiency. While selling a property quickly and below its potential value is not illegal, it can lead to substantial financial losses for sellers. A key issue is the limited transparency of transaction data in residential real estate markets, particularly in Switzerland, where such data are often not publicly available. This lack of clarity makes it difficult for sellers to assess whether transaction prices are appropriate. Regulatory authorities could address these inefficiencies by promoting greater transparency, for example through improved access to transaction data and standardized reporting of broker performance. Enhancing transparency in both broker activities and market transactions would improve price discovery and overall market outcomes, especially given that sellers typically do not observe the counterfactual price their property could have achieved.

References

Abidoye, R. B., & Chan, A. P. (2017). Modelling property values in Nigeria using artificial neural network. Journal of Property Research, 34(1), 36-53.

Abidoye, R. B., & Chan, A. P. (2018). Improving property valuation accuracy: a comparison of hedonic pricing model and artificial neural network. Pacific Rim Property Research Journal, 24(1), 71-83.

Agarwal, S., He, J., Sing, T. F., & Song, C. (2019). Do real estate agents have information advantages in housing markets? Journal of Financial Economics, 134(3), 715–735.

Ahlenius, M., Berggren, B., & Hurst, N. (2025). 50 Years of Research in Real Estate Brokerage: A Semi-Systematic Literature Review. Real Estate, 2(4), 21.

Anglin, P. M., & Arnott, R. (1991). Residential real estate brokerage as a principal–agent problem. Journal of Real Estate Finance and Economics, 4(2), 99–125.

Anundsen, A. K., Larsen, E. R., & Sommervoll, D. E. (2020). Strategic price-setting and incentives in the housing market. Working Paper Series.

Banerjee, R., & Paciorek, A. (2025). Commissions and Omissions: Trends in Real Estate Broker Compensation. FEDS Notes.

Barwick, P. J., & Wong, M. (2019). Competition in the real estate brokerage industry: A critical review. The Brookings Institution Publication, 1-38.

Baryla, E., & Zumpano, L. V. (1995). Buyer search duration in the residential real estate market: The role of the real estate agent. Journal of Real Estate Research, 10(1), 1–13.

Boone, J. (2008). A new way to measure competition. The Economic Journal, 118(531), 1245-1261.

Brastow, R. T., Springer, T. M., & Waller, B. D. (2012). Efficiency and incentives in residential brokerage. The Journal of Real Estate Finance and Economics, 45(4), 1041-1061.

Björklund, K., Alex Dadzie, J., & Wilhelmsson, M. (2006). Offer price, transaction price and time-on-market. *Property Management*, *24*(4), 415-426.

Case, K. E., & Shiller, R. J. (1989). The Efficiency of the Market for Single-Family Homes. The American Economic Review, 125-137.

Case, K. E., & Shiller, R. J. (1990). Forecasting prices and excess returns in the housing market. Real Estate Economics, 18(3), 253–273.

Capozza, D. R., & Seguin, P. J. (1996). Expectations, efficiency, and euphoria in the housing market. *Regional Science and Urban Economics*, *26*(3-4), 369-386.

Chinloy, P., & Winkler, D. (2010). Contract incentives and effort. Journal of Real Estate Research, 32(4), 397-412.

Crockett, J. H. (1982). Competition and efficiency in transacting: the case of residential real estate brokerage. Real Estate Economics, 10(2), 209-227.

Di Maggio, M., Egan, M., & Franzoni, F. (2022). The value of intermediation in the stock market. *Journal of Financial Economics*, *145*(2), 208-233.

Engelhardt, G. V. (2003). Nominal loss aversion, housing equity constraints, and household mobility: Evidence from the United States. Journal of Urban Economics, 53(1), 171–195.

Elder, H. W., Zumpano, L. V., & Baryla, E. A. (1999). Buyer search intensity and the role of the residential real estate broker. Journal of Real Estate Finance and Economics, 18(3), 351–368.

French, N., & Gabrielli, L. (2004). The uncertainty of valuation. Journal of Property Investment & Finance, 22(6), 484–500.

Garmaise, M. J., & Moskowitz, T. J. (2004). Confronting information asymmetries: Evidence from real estate markets. Review of Financial Studies, 17(2), 405–437.

Genesove, D., & Mayer, C. (2001). Loss aversion and seller behavior: Evidence from the housing market. Quarterly Journal of Economics, 116(4), 1233–1260.

Geltner, D. M., Kluger, B. D., & Miller, N. G. (1992). Incentive commissions in residential real estate brokerage. Journal of Housing Economics, 2(2), 139-158.

Gholipour Fereidouni, H. (2012). The role of real estate agents on housing prices and rents: the Iranian experience. International Journal of Housing Markets and Analysis, *5*(2), 134-144.

Han, L., & Hong, S. H. (2011). Testing cost inefficiency under free entry in the real estate brokerage industry. Journal of Business & Economic Statistics, 29(4), 564–578.

Hsieh, C. T., & Moretti, E. (2003). Can free entry be inefficient? Fixed commissions and social waste in the real estate industry. Journal of Political Economy, 111(5), 1076–1122.

Kahneman, D., & Tversky, A. (2013). Prospect theory: An analysis of decision under risk. In Handbook of the Fundamentals of Financial Decision Making: Part I (pp. 99–127).

Kok, N., Koponen, E. L., & Martínez-Barbosa, C. A. (2017). Big data in real estate? From manual appraisal to automated valuation. Journal of Portfolio Management, 43(6), 202–211.

Küttel, T., Müller, M., Richter, T., & Seiberlich, R. (2025). Relatives Blasenrisiko bei Immobilien: Eine erweiterte Analyse auf Basis verschiedener Assetklassen. *Swiss Real Estate Journal*, *30*, 52–61.

Larceneux, F., Lefebvre, T., & Simon, A. (2015). What added value do estate agents offer compared to FSBO transactions? Explanation from a perceived advantages model. Journal of Housing Economics, 29, 72-82.

Larsen, E. R., & Weum, S. (2008). Testing the efficiency of the Norwegian housing market. *Journal of Urban Economics*, *64*(2), 510-517.

Laurice, J., & Bhattacharya, R. (2005). Prediction performance of a hedonic pricing model for housing. Appraisal Journal, 73(2), 198–209.

Levitt, S. D., & Syverson, C. (2008). Market distortions when agents are better informed: The value of information in real estate transactions. Review of Economics and Statistics, 90(4), 599–611. https://doi.org/10.1162/rest.90.4.599

Marsh, G. A., & Zumpano, L. V. (1988). Agency theory and the changing role of the real estate broker: Conflicts and possible solutions. Journal of Real Estate Research, 3(2), 151–164.

McCluskey, W. J., McCord, M., Davis, P. T., Haran, M., & McIlhatton, D. (2013). Prediction accuracy in mass appraisal: A comparison of modern approaches. Journal of Property Research, 30(4), 239–265.

Miceli, T. J. (1991). The multiple listing service, commission splits, and broker effort. Real Estate Economics, 19(4), 548–566.

Müller, M., Richter, T., & Seiberlich, R. (2023). Relatives Blasenrisiko: Empirische Evidenz von Immobilien und Gold. Swiss Real Estate Journal, *27*, 4–13.

Munneke, H. J., & Yavas, A. (2001). Incentives and performance in real estate brokerage. The Journal of Real Estate Finance and Economics, 22(1), 5-21.

Pietrzak, A., Richter, T. J., & Seiberlich, R. (2025). Equal access denied: analyzing gender discrimination in rental housing. Journal of European Real Estate Research, 18(2), 312-326.

Pollestad, A. J., Næss, A. B., & Oust, A. (2026). Towards a Better Uncertainty Quantification in Automated Valuation Models. Journal of Real Estate Finance & Economics, 72(3).

Pollakowski, H. O., & Ray, T. S. (1997). Housing price diffusion patterns at different aggregation levels: an examination of housing market efficiency. *Journal of Housing Research*, 107-124.

Rutherford, R., Springer, T. M., & Yavas, A. (2005). Conflicts between principals and agents: Evidence from residential brokerage. Journal of Financial Economics, 76(3), 627–665.

Tchuente, D. (2026). Real estate automated valuation model with explainable artificial intelligence based on Shapley values. The Journal of Real Estate Finance and Economics, 72(3), 567-605.

Thaler, R. H. (1980). Toward a positive theory of consumer choice. Journal of Economic Behavior & Organization, 1(1), 39–60.

Turnbull, G. K., & Dombrow, J. (2007). Individual agents, firms, and the real estate brokerage process. Journal of Real Estate Finance and Economics, 35(1), 57–76.

Turnbull, G. K., & Waller, B. D. (2018). (What) do top performing real estate agents deliver for their clients?. Journal of Housing Economics, 41, 142-152.

Tversky, A., & Kahneman, D. (1991). Loss aversion in riskless choice: A reference-dependent model. Quarterly Journal of Economics, 106(4), 1039–1061.

Yavaş, A. (1996). Matching of buyers and sellers by brokers: A comparison of alternative commission structures. Real Estate Economics, 24(1), 97–112.

Zorn, T. S., & Larsen, J. E. (1986). The incentive effects of flat-fee and percentage commissions for real estate brokers. Real Estate Economics, 14(1), 24-47.