Agency Choice and Financial Consequences: Evidence from the Sydney housing market

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Abstract

This paper studies the seller's agency choice and the financial consequences of this decision. Specifically, at sale, sellers can choose to use either the same agency they originally purchased the house from, or a different agency. Since the same agency sold the property before, it has an informational advantage by knowing the property and principal. Using housing market transaction data in Sydney, the largest capital city in Australia, we show that sellers make their agency choice based on past purchase experience, non-salient features of the property, and the current market shares of the agency. Furthermore, our analysis of pair sale transactions reveals that using the same agency results in a 1.1--1.4% return discount compared to using a different agency. The findings support agency theory, which suggests that using the same agency may not be financially beneficial for the principals due to its informational advantage.

Keywords: real estate brokerage, agency choice, principal agent problem, agency value, asymmetric information

JEL codes: R21, R31, L85

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1 Introduction

This paper examines the seller's agency choice and the financial consequences of this decision at sale, drawing on previous research on principal-agent problems (Garmaise & Moskowitz, 2004; Levitt & Syverson, 2008; Agarwal et al., 2019b). Specifically, we extend the work of Rutherford et al. (2005) and Levitt and Syverson (2008) by proposing an alternative estimation approach that focuses on agency firms, rather than individual agents, due to the challenges of disentangling individual agent ability from agency problems in collaborative sales. Throughout this paper, the terms "agent" and "agency" refers to the seller's agency.[1] In Australia, unlike in the United States, there is only a *single* agency (representing the seller) involved in a home sale, and buyers directly interact with that agency. This single agency arrangement in the Australian housing market provides an ideal setting for studying the principal-agent problem compared to markets where dual agencies exist, such as in Brastow and Waller (2013), Kadiyali, Prince and Simon (2014) and Johnson, Lin and Xie (2015). This unique feature of single agency in the Australian housing market helps to better reveal the principal-agency problem, specifically focusing on the seller's agent.

When homeowners decide to sell, they can choose to work with either the same agency they originally purchased the house from, or a different agency. We assume that the same agency has an informational advantage over other agency firms because it sold the property previously and may have maintained contact with the principal after the sale. As a result, it knows more about the property, its market value, and the principal. However, whether this informational advantage possessed by the same agency can lead to a higher return for the principal is

[1] We are not studying the dual agency problem in this paper.

questionable, as agency theory also suggests that the agents may exploit this informational advantage for their own benefit rather than for the principal's.

Our identification strategy comprises several steps. Firstly, we use a hedonic regression to estimate the firm-level agency value and the value of a property's non-salient features in each property transaction, using a full market sample of micro-level property transaction data. Secondly, we apply a probit model in a pair sale analysis to understand the principal's agency choice, controlling for the agency value and the value of a property's non-salient features estimated in the first step. Thirdly, we compare the returns on pair sale to understand the financial benefit or cost of hiring the same agency, using the Heckman two-step method to alleviate concerns of sample selection and endogeneity stemming from the fact that principals choose only one agency at sale. Lastly, we check for the impacts of various factors such as property's time-on-market, heterogeneity of agency value, change of building quality, flipped sales, non-pecuniary benefits, agent-owned homes, and neighbourhood characteristics on our results.

Using a large housing transaction dataset in Sydney, Australia, our empirical results suggest that agency value is significant in real estate transactions. It accounts for about 10% of unexplained variation in property transaction prices and plays a vital role in the seller's subsequent agency choice. Specifically, sellers are more likely to stay with the same agency if the firm that they encountered in the purchase transaction had a high value, and if the property has more positive non-salient (luxury) features. However, using the same agency has a persistent and negative relationship with pair sale returns, resulting in 1.1--1.4% lower returns compared to hiring a different agency. Yet, there is a small financial benefit from using the same agency if the property has some positive non-salient features, emphasizing the importance of the same agency's informational advantage in realising the value of the property's non-

salient features. For every ten percent increase in the value of the property's non-salient features, hiring the same agency predicts an additional return of 0.35% at the time of sale. Therefore, unless the property has a significant amount of positive non-salient selling attributes, our research suggests that sellers should switch agencies to achieve better financial outcomes.

This paper contributes to the literature in several ways. First, we propose a new strategy to understand agency value in the housing market. We show agency value is heterogeneous and time-varying across agency firms and geographic locations, highlighting the importance of agency choice in real estate transactions. While Kurlat and Stroebel (2015) demonstrates that asymmetric information between sellers and buyers affects housing market outcomes, resulting in subsequent price declines of housing, out study shows informational advantage of selling agency predicts return discounts in subsequent sales.

Second, we propose a revealed preference method for understanding the rationale behind the seller's agency choice. Our hypothesis is that both past experience and current information influence the principal's agency choice at sale. As it is difficult to observe the principal's selling experience (if any) and indirect learning through others, our approach relies on the fact that the principal/seller can perceive the quality of at least one agency from past experience—that is, the agency they originally bought the house from.

Third, we contribute to the ongoing debate around how to mitigate the principal-agent problem. While various compensation structures, such as fixed-percentage commission, flat-fee, or consignment have been proposed in the real estate market (Arnold, 1992; Munneke & Yavas, 2001), a range of agency problems still exist in practice (Sirmans, Turnbull & Benjamin, 1991; Hsieh & Moretti, 2003; Ondrich, Ross & Yinger, 2003; Barwick et al., 2007; Clauretie & Daneshvary, 2008; Levitt, Syverson & Ferreira, 2008; Levitt & Syverson, 2008; Brastow et al., 2012; Han & Hong, 2016; Bayer et al., 2017; Bian, Turnbull & Waller, 2017). In Australia,

evidence for whether auctions or negotiations result in higher final sale prices is ambiguous. Lusht (1996) claims that auctioned properties in Melbourne sell for 8% higher than negotiated properties. However, Frino et al. (2012) found no significant differences in prices between properties sold at auction and those sold by private treaty when correcting for self-selection biases in the Sydney housing market. Although auctions may seem like a way to mitigate the agency problem due to their competitive and transparent process, they can also lead agents to rely more on the auction method itself rather than exerting their best efforts to find bidders and achieve the best possible prices for sellers. Furthermore, auctions may not be suitable for all properties in all circumstances and can make the purchase of housing more difficult or risky for certain groups in Australia (Maher, 1989). Our research contributes to this debate by empirically showing that principals could help to alleviate the principal-agent conflict through informed agency selection.

Our research has some practical implications in the real estate market. First, using the same agency in a transaction tends to result in a return discount in subsequent sales. Therefore, homeowners should carefully consider their selection of sales agencies based on factors such as their past purchase experience, the value of non-salient features of their properties, and the current information about the agency, including its market shares, reputation, and skills. Secondly, for agencies, it is important to prioritise efforts to expand their market shares rather than retaining buyers in subsequent sales, except for those buyers who purchased properties with a substantially high value of non-salient features.

Our findings have broader implications, not only in the real estate market, but also to other financial markets (e.g., stock brokers and clients) where a principal-agent relationship exists. Our research suggests that the hypothesis that repeated interactions diminish the effects of misaligned incentives may not always hold true. Of course, the conflict of interest may cost the

agent reputational capital (e.g., less business), but this is difficult to accurately quantify. Instead, we show that using the same agency for repeated business may be convenient, it may not always be financially in the interest of principals. Thus, consumers, shareholders or government officials must remain vigilant about potential conflict of interests due to informational advantage of their selected agency.

The rest of the paper is organised as follows. Section 2 presents an overview of the Australian brokerage industry, with a specific focus on the Sydney housing market. Section 3 describes the data and empirical strategy. Section 4 presents the main results. Section 5 presents additional robustness checks. Section 6 concludes.

2 Australian Brokerage Industry

In the Australian housing market, the transaction typically involves only a seller's agent. The most common type of agency contract is an exclusive agency agreement, which grants the agent exclusive rights to sell the property and retain the entire commission during a fixed term. Prospective buyers interact with the seller's agent, not the seller directly. Buyers rarely have agents in Australia, and if they do, these agents are paid for by the buyer not the seller.

2.1 Real Estate Agents and Commission Fees in the Sydney Housing Market

To become a real estate agent in Australia, the person must complete an approved real estate course and apply for a licence. The licence requirements vary from state to state, but it often requires the person to have at least 12 months of supervised work experience as an assistant agent before applying for a full license. To renew their licence, agents must complete continuing professional development (CPD) on an annual basis. If they do not comply with their CPD requirements, their licence will be suspended.

Agency compensation structure is straightforward. The seller pays a fixed rate commission to their listing agency, which is normally between 2-3% of the selling price in Sydney. Scale commissions exist, but are rare in the Australian housing market. This is in contrast to the United States, where there are often two agents involved in a transaction and a realtor typically charges a 6% commission fee, splitting it 50/50 between the seller's agent and buyer's agent. Additionally, there are other upfront costs to selling a house, mainly conveyancing, marketing, and maintenance expenses. If the seller chooses to sell the property via auction, there is an additional auction fee. It is worth noting that commission rates and other selling costs tend to be similar among agency firms within the same locality in Sydney, and discounts in commission fees have been found to have little impact on transaction prices (e.g., Rutherford & Yavas, 2012). Therefore, commission rates and other selling costs are not considered in this analysis due to lack of available data.

2.2 Agency Firms in the Sydney Housing Market

Sydney is the capital city of New South Wales in Australia, with a population over 6 million people. The greater Sydney area comprises 31 Local Government Areas (LGA), 229 postcodes, and 658 suburbs. Our data shows that there were 3,636 agency firms operating in the Sydney metropolitan area between 2001 and 2017. Among these 3,636 agency firms, the average operation is about 4.5 years with a minimum of 1 year and maximum of 17 years. On average, an agency completes 200 sales, with a minimum of 1 and maximum of 79,363 sales over the sample period. As the median operation years and the number of sales completed are both significantly lower than their respective averages, the agency distribution is skewed towards smaller firms in the Sydney housing market. Larger firms operate across multiple locations in the Sydney metropolitan area, while smaller agency agencies tend to focus on specific areas.

Figure 1 shows that the annual number of agency firms in the greater Sydney area (city level) increased from 633 in 2001 to 1,174 in 2007 before the Global Financial Crisis (GFC), and has stayed between 1,000 and 1,100 since then. The suburb level estimates follow a similar trend, with the number of agency firms increasing from 4,740 in 2001 to 13,000 in recent years, which is equivalent to an average 15 agency firms in a typical suburb.[2]

<Insert Figure 1 about here>

3 Data Construction and Empirical Model

3.1 Residential Property Sale Data and Pair Sales

Residential property sale data for the Sydney metropolitan area from 2001-2017 was provided by the Rozetta Institute (formerly Securities Industry Research Centre of Asia-Pacific (SIRCA)) on behalf of CoreLogic.[3] The data record includes property ID, transaction date, transaction price, transaction method (auction or negotiation), agency, suburb, property type (unit or house), and property characteristics (such as land area, number of bedrooms and bathrooms, and car space). To remove outliers, the top 99.5% and bottom 0.5% of each variable were used as an upper and lower bound (refer to Appendix A for details on the data cleaning process). This results in a balanced sample of 395,705 house sales and 252,711 unit sales.

[2] As agency firms can operate in multiple suburbs, the number of agency firms at the suburb level is higher than at the city level. The drop in the agency number in 2017 was mainly because we don't have a complete sale data in 2017. Our data ended in September/October 2017.

[3] CoreLogic is a leading property data provider in Australia, New Zealand, and the United States. It provides detailed residential property transaction data that is widely used by lending institutions, mortgage brokers, and property professionals such as real estate agents and valuers (appraisers) in real estate transactions. This dataset has been widely recognised and trusted in the industry for its accuracy and reliability. For more information about CoreLogic and its data services, please visit its website at https://www.corelogic.com.

Multiple transactions for each property were identified using property ID, and two consecutive transactions of the same property were defined as a "pair sale".[4] For each pair sale, the perspective of the seller in the second transaction was analysed, with the first transaction defined as the "purchase transaction" and the second transaction as the "sale transaction". To address potential unbalanced panels for agency choice analysis, pair sales were excluded if the number of bedrooms, bathrooms, car parks, and/or land areas changed within pair sales or if the agency firm in the purchase transaction was not available at the time of sale (i.e., the agency disappeared). This resulted in a final 136,898 pair sales.

Table 1 provides summary statistics for the data, with Panel A1 displaying statistics for the full sample and Panel A2 showing statistics for the subsample of pair sales. It should be noted that the land area of an apartment unit is not well-defined or recorded, especially for high-rise apartments, so we excluded land area for apartment units in our specifications. Compared to the full sample, statistics for the pair sale subsample in Panel A2 are not significant different, except for sale prices. This could be attributed to repeat-sales being more likely to occur in the inner-city, where demand is high.

<Insert Table 1 about here>

Table 2 shows agency market shares, based on the agency's annual transaction volumes in a suburb. High-market share firms are those with the number of sales above the market average, and vice versa. The results show that the probability of a high market-share firm winning repeated business is almost triple the chance for a low market-share firm (76% vs 24%). If principals choose a different agency, 58% of them hire high market-share firms and 42% select

[4] If multiple transactions are observed with a particular property, any two consecutive transactions are defined as pair sales. For example, if one property is sold three times over the studied period, there will be two pair sales generated from this property.

low market-share firms. This is consistent with the literature that suggests consumers use market share as an indicator of firm quality (e.g., Khandelwal, 2010).

<Insert Table 2 about here>

3.2 Estimating Agency Value and the Value of Non-Salient Features

To calculate the agency value and the value of a property's non-salient features, we apply a hedonic pricing model to the full sample, which is as follows:

$$\ln(Sale\ price_{it}) = \alpha_1 + \alpha_2 \ln(X_{it}) + Agency_{jdt} + Postcode_p + Time_t + \varepsilon_{it}. \quad (1)$$

where $Sale\ price_{it}$ is the *i*th property's sale price at sale time *t*, and X_{it} is a vector of property characteristics that includes the number of bedrooms, bathrooms, carparks, and land area. $Agency_{jdt}$ is the agency-district-year fixed effect. $Postcode_p$ is a postcode dummy that accounts for location amenities, $Time_t$ is a calendar quarter-year dummy, and ε_{it} is the error term.

The agency value is measured by the agency fixed effect, $Agency_{jdt}$ in the above equation, which captures the unobserved agency-level characteristics that affect the property's sale price, such as firm size, reputation, service level, and skill. It is time-varying and reflects overall agency performance in the locality for all agents working in the same agency firm. Since large agencies such as LJ Hooker often operate as a franchise in each local government area (LGA) in Sydney, we estimate the agency value by LGA and year in the above specification to account for differences in agency performance across different districts and over time.

The value of non-salient features is calculated as the price difference between the property's transaction and predicted sale prices—the residual ε_{it} in the above equation. It accounts for the value of all other features not controlled for in the regression (e.g., Genesove & Mayer, 2001).

The value has a stochastic feature due to changing market conditions and idiosyncratic consumer tastes. The hedonic regression results for houses and units are reported in Appendix A.

The possibility of omitted variables is of concern. For example, Liu et al. (2020) found that failing to account for unobserved property characteristics could inflate the perceived sale price difference between agent-owned and non-agent-owned properties. We acknowledge this limitation of the paper. The supplied data did not include (x,y) coordinates or property addresses, but rather property IDs. As a result, we were unable to incorporate variables such as school catchments and distance to train stations into our analysis. However, we accounted for these missing variables to some extent by including location (postcode) fixed effects in our hedonic price analysis. Subtle variations within each location are unobservable and retained within the regression residuals in equation (1), which are captured in the value of the property's non-salient features used in the subsequent agency choice and return models. While the estimated agency value and the value of the property's non-salient features in our hedonic regression may be noisy, they are not biased. This estimation method is widely used in the literature and is transparent in decomposing property sale prices (e.g., Genesove & Mayer, 2001).

Panel B of Table 1 presents summary statistics for the estimated agency value, value of non-salient features, and other main variables used in the pair sale analysis. The average agency value in the purchase transaction was -0.001, and the average value of the property's non-salient features was -0.013, i.e., 1.3% below the predicted property sale price. Among all pair sales, 21% of transactions involved the same agency, and 70% used negotiation. The average resale duration was about 59 months (6 years).

3.3 Developing an Agency Choice Model

Next, we apply a binary choice model to reveal principal preference over agency firms. We assume that principals aim to maximize their indirect utility, which can be expressed as follows:

$$\mu_{it} = C_{it-}^{+}\beta_c + PA_{it-}\beta_{PA} + VNSF_{it-}\beta_v + D_{it}\beta_D + SAMS_{it}^{+}\beta_S +$$

$$HHI_{it}\beta_H + T_i^{+}\beta_T + FE_{it} + \varepsilon_{it}. \qquad (2)$$

where μ_{it} is the utility of principal *i* from hiring an agency to sell their house at time *t*. C_{it-}^{+} is a binary variable that denotes the transaction method used at purchase time *t−,* where one represents negotiation and zero represents auction.[5] PA_{it-} is the agency value experienced by the principal in the purchase transaction. $VNSF_{it-}$ is the value of the property's non-salient features purchased by the principal in the purchase transaction. D_{it} is the natural logarithm of the duration (in months) of a pair sale at sale time *t*. $SAMS_{it}^{+}$ is a dummy variable that accounts for the chosen agency's market share at sale time *t*, with a value of one for market share above average in a suburb and zero otherwise. HHI_{it} is the Herfindahl-Hirschman index (HHI) that is calculated as the sum of squared agency sale shares per year in a suburb, indicating the agency market concentration at sale time *t*. T_i^{+} is a dummy variable that represents the property type (unit=1 and house=0), and FE_{it} are fixed effects for location (postcode) and time (quarter-year). These fixed effects capture the specific characteristics of each location and time period, helping to control for potential changes in the buyer composition and other factors that may affect our results. ε_{it} is the error term that captures all unobservable factors contributing to utility, and we assume it follows a standard normal distribution. Standard errors are bootstrapped as agency value and non-salient features are estimated using the hedonic model in equation (1).

[5] The notation t− indicates the purchase time. As the duration of ownership varies across sellers, we leave the duration open.

We simplify our choice model by forgoing status-quo bias (e.g., see Masatlioglu & Ok, 2005), as choosing the same agency is not the default option for the principal, given that agency was randomly encountered by the principal at the time of purchase. Moreover, there is no fiduciary relationship between the principal and the original agency that the principal bought the house from. Hence, a principal's decision is given by,

$$y_{it} = \begin{cases} 1 \;\; if \; \mu_{it} \geq \bar{\mu}_{it} \\ 0 \;\; if \; \mu_{it} < \bar{\mu}_{it} \end{cases}. \tag{3}$$

where y_{it} is a binary variable indicating whether principal *i* hires the same agency or not (= 1 if yes; 0, otherwise), and $\bar{\mu}_{it}$ is the reservation utility from choosing a different agency.

Assumption 1: The mean utility from hiring a different agency firm is normalized to zero; therefore, $\bar{\mu}_{it} = \varepsilon_{it}$.

Assumption 1 implies that the utility from hiring a different agency firm is heterogeneous across principals, and follows a standard normal value distribution. We justify this assumption by positing that the option of choosing a different agency generates a reservation utility that is idiosyncratic and random. Given the distribution of the error term, we can use a probit model to predict the probability of choosing the same agency as follows,

$$Pr\{y_{it} = 1 | \, Z\} = \Phi(Z\beta). \tag{4}$$

Where Φ is the cumulative density function of the standard normal distribution, and Z is the matrix of regressors included in equation (2). We then apply maximum likelihood estimation (MLE) to estimate the parameters in the utility function. The log-likelihood function for our estimation is given by,

$$\sum_i \sum_t y_{it} \log(Pr\{y_{it} = 1 | \, Z\}) + (1 - y_{it}) \log\,(1 - Pr\{y_{it} = 1 | \, Z\}). \tag{5}$$

3.4 Measuring the Effect of Same Agency on Pair Sale Returns

For the premia analysis, we follow the repeat-sale literature (e.g., Bailey et al., 1963; Figlio & Lucas, 2004) and adopt the Heckman two-step method (Heckman, 1976) to address potential sample selection and endogeneity issues in a pair sale analysis. In the first step, we obtain the inverse Mills ratio from the agency choice model (equation (2)), which is then used as a regressor in the second step OLS model as follows:

$$Log(P_{it}/P_{it-}) = Same\ agency_{it}^{+}\beta_a + VNSF_{it-}\beta_v + Same\ Agency_{it}^{+} \times VNSF_{it-}\beta_{av} + SAMS_{it}^{+}\beta_s + D_{it}\beta_d + T_i^{+}\beta_t + Inv\ MR_{it}\beta_i + FE_{it} + \varepsilon_{it}. \quad (6)$$

where $Log(P_{it}/P_{it-})$ is the natural logarithm of the property's sale price divided by its purchase price (return of the pair sale). $Same\ agency_{it}^{+}$ is a dummy variable that equals one if the same agency is used in the subsequent transaction, and zero otherwise. $Inv\ MR_{it}$ is the inverse Mills ratio obtained in the first step of the agency choice model. Other variables are the same as in equation (1). Standard errors are obtained by bootstrapping.

The effect of using the same agency on pair sale returns is measured by the agency dummy variable ($Same\ agency_{it}^{+}$). Property characteristics are examined relative to a reference point, which is represented by the value of the property's non-salient features ($VNSF_{it-}$) at the time of purchase. We assume features of the house such as the number of bedrooms, bathrooms, car parks and land areas do not change in the second sale. We also consider agency market share at the time of sale ($SAMS_{it}^{+}$), sale duration (D_{it}) between the first and second sales, property type (T_i^{+}), inverse Mills ratio ($Inv\ MR_{it}$), and postcode and calendar quarter-year dummies.[6] In Section 5.2, we discuss other possible channels that could affect our results, such as the

[6] We excluded the purchase agency value, type of purchase method, and HHI from the return regression as they affect the principal's agency choice but not the current sale price.

heterogeneity of agency value, change in building quality, flipped sales, non-pecuniary benefits, inexperienced agents, agent-owned homes, common time-varying effect, and neighbourhood characteristics.

We are interested in the coefficient on the same agency dummy β_a and its interaction term with the value of the property's non-salient features β_{av}. β_a reveals the financial cost/benefit of hiring the same agency, and β_{av} shows the moderation effect of hiring the same agency when accounting for the property's characteristics. Since the same agency has an informational advantage (e.g., familiarity with the property) compared to other agencies, it is expect that the same agency can better realise the value of the property's non-salient features at the time of same. Therefore, the expected sign of β_{av} is positive. However, staying with the same agency may not necessarily result in additional financial benefits to the principal, as there is a possibility that the agents may exploit this informational advantage for their own benefit. Thus, the expected sign of β_a could be negative.

4 Main Results

4.1 Agency Choice

Table 3 presents the probit model results for revealed preference in agency choice. Our baseline model in Column (1) shows that the type of purchase method and the agency value that the principal encountered at the time of purchase significantly affects the seller's choice, indicating that past experience with the agency influences current agency selection. Specifically, a positive purchase experience with the agency increases the likelihood of staying with the agency. Column (2) shows that property's non-salient features positively affect the agency choice, suggesting that sellers prefer to hire the same agency if the property has some luxury features such as swimming pools, waterfronts, views, and other building or location amenities.

This result is intuitive because the value of the property's non-salient features reflects the effort or skill required from the agency. Since the same agency sold the property before, the realised value of the property's non-salient features should inform whether the principal remains with the same agency in the subsequent sale (e.g., see Zeithaml, Berry & Parasuraman, 1996). In Column (3), we interact the agency value with the property's non-salient features and find a positive and significant effect on the principal's decision to choose the same agency. This suggests that the informational advantage with the same agency is more pronounced when the property has a high value of non-salient features. In Column (4), we add quadratic terms for agency value, which shows that the past agency value has a diminishing impact on the current agency choice.

Apart from past experience, principals also use current information about the agency in their decisions. Our results indicate that principals are more likely to hire an agency with a large market share, which is consistent with the literature that suggests consumers use market share as an indicator of firm quality when direct experience with the firm is unavailable (e.g., Khandelwal, 2010). Duration is another factor that affects the seller's agency choices. When the duration between purchase and sale is long, the principal is less likely to choose the same agency. This could be because negative experiences are more memorable over a longer period of time. Market competition and property type also influence agency choice. Principals are more likely to choose the same agency when the market is more concentrated (higher HHI), which is intuitive as fewer choices in the market imply a greater chance of selecting the same agency. Finally, the same agency is more likely to be hired when the property is an apartment unit. One possible explanation is that apartments (compared to houses) are more commonly purchased for investment purposes. In Sydney, sale agencies also provide rental services, and

a long-term investment relationship could increase the likelihood of the same agency being chosen in the subsequent sale.[7]

<Insert Table 3 about here>

4.2 Implications on Pair Sale Returns

The OLS regressions based on the Heckman two-step are reported in Table 4. Column (1) shows that hiring the same agency ($Same\ agency_{it}^{+}$) results in a 1.2% discount on pair sale returns compared to using a different agency. This could be attributed to the informational advantage with the same agency may induce the agents to put in less effort for repeated businesses. Additionally, the duration between sales (D_{it}) is positively correlated with returns, and house prices appreciate faster than unit prices (T_i^{+}). The inverse Mills' ratio ($Inv\ MR_{it}$) is positive and statistically significant, indicating the importance of correcting for selection bias in the OLS regression.

In Columns (2), we include the value of the property's non-salient features ($VNSF_{it-}$). The results show that the value of non-salient features is negatively correlated with capital gains, indicating that returns are "error" correcting with respect to the property's non-salient features. This implies that if the principal paid a higher price for the property's non-salient features, it would lower the principal's return in the subsequent sale, regardless of whether the same or a different agency is used.

In Column (3), the coefficient on the interaction term ($Same\ agency_{it}^{+} \times VNSF_{it-}$) is positive and statistically significant, indicating that hiring the same agency when the value of non-salient features is high results in higher returns (than when there are few non-salient features).

[7] We combined houses and units to increase the sample size in the pair sale analysis and used a dummy variable of property type to capture the behavioural difference in agency choice between the house and unit sellers.

This suggests that the same agency's informational advantage is beneficial during the sale process if the property has more positive features that are not easily valued, such as a stunning view or well-maintained garden. However, in order to offset the negative effect of hiring the same agency (-0.011), the value of non-salient features required must be more than 0.333[8] or 33.3% above the standardized property value. Thus, unless the property has a substantial amount of non-salient features, choosing a different agency is generally better than hiring the same agency in practice. Controlling for the sale agency's market share ($SAMS_{it}^{+}$) in Column (4) does not change our conclusions.[9]

<Insert Table 4 about here>

5 Additional Checks

5.1 Time on Market (TOM)

In this section, we check whether the same agency sells the property faster than a different agency (to minimize TOM, as explained in Levitt and Syverson (2008)). Alternatively, the seller could be more motivated to sell the property quickly (Xie, 2017). We use the Heckman two-step method to regress the property's time-on-market against the principal's agency choice, in the following model:

[8] 0.011/0.033=0.333

[9] The diverse nature of the Sydney housing market implies that various submarkets could develop their own price trends over time (e.g., see Pawson & Martin, 2021). To account for this dynamic heterogeneity across different regions, we have further grouped the Sydney metropolitan area into five main regions based on the Greater Sydney Region Plan. We then included interaction terms between year dummies and each main region in the pair sale analysis. Adding sale methods or regional time trends to Table 4 does not change our results. These results are available upon request. We further examined how neighbourhood characteristics can influence the principal's agency choices and subsequent sale prices, using census suburb demographics as a proxy in Section 5.5..

$$TOM_{it} = Same\ agency_{it}^{+}\beta_a + VNSF_{it-}\beta_v + SAMS_{it}^{+}\beta_s + D_{it}\beta_d + C_{it}^{+}\beta_c + S_i\beta_m + T_i^{+}\beta_t + Inv\ MR_{it}\beta_i + FE_{it} + \varepsilon_{it}. \quad (7)$$

where TOM_{it} is the natural logarithm of the time (in months) it takes to sell property *i* at sale time *t*. S_i is a vector of property structure characteristics including number of bedrooms, bathrooms, and car spaces. Other variables are the same as in equations (2) and (6).

The TOM results are in Table 5. Column (1) reports the OLS results and Column (2) presents the Heckman two-step results. Both columns show that there is no significant difference in marketing time between using the same agency and a different agency. This finding is in line with Rutherford et al. (2005) who found that agent-owned houses sell no faster than client-owned houses, and suggests that there is no evidence of motivation heterogeneity, i.e., sellers who use the same agency aren't necessarily willing to sell faster.

In addition to the agency choice, our results show houses with more non-salient features stay on the market longer. Negotiations take longer than auctions, and units sell faster than houses. Property characteristics such as the number of bedrooms, bathrooms, and car parks are also positively correlated with selling time. Interestingly, we find that properties sold by agency firms with high market share tend to have shorter TOMs, suggesting that these firms have the knowledge and exposure to potentially maximize returns and minimize the time taken to sell the property (e.g., Agarwal et al., 2019b; Benjamin & Chinloy, 2000).

<Insert Table 5 about here>

5.2 Heterogeneity of Agency Value

In the agency choice model, the firm-level agency value is used as a proxy for the agency's performance in the locality. The hypothesis is that the principal will rely on this information to assess whether or not to hire the same agency in the subsequent sale. Under this conjecture, it

is expected that the principal's agency choice becomes more clear when agency value is large (in absolute value).

Table 6 shows the results for the same agency choice around the encountered agency value in the purchase transaction. Column (1) reports the main estimation from Column (2) of Table 3, while Columns (2)-(4) show the results for agency values within a +/-10%, +/-5% and +/-2.5% margin, respectively. The table indicates that agency value, value of the property's non-salient features, and the agency's current market share are all positively correlated with the same agency choice. However, in Column (4), agency value becomes statistically insignificant within the +/-2.5% margin. This suggests that when the heterogeneity in agency value is small (close to zero), principals rely on current information such as the selected agency's market share and *ex ante* amount of required work given to the property's non-salient features to make their decisions.

<Insert Table 6 about here>

5.3 Change of Building Quality, Flipped Sales, Non-pecuniary Benefits, Less Experienced Agents and Agent-owner Effect

The assumption that the change in price when the same house sells twice represents a quality-controlled price change is convenient for our study, especially because we lack detailed property characteristics and information on building permits. However, this assumption may not hold in cases where the property has undergone significant renovations. Additionally, there could be other potential factors that affect the same agency discount. For instance, Agarwal et al. (2019a) find that some sellers accept a discount to sell to buyers in ethnic enclaves, while others earn a premium when selling to members of their own race. For the agent-owner effect, Levitt and Syverson (2008) analysed home sales in Illinois and found that homes owned by real estate agents sold for 3.7% more than other houses and stayed on the market for 9.5 days

longer. Similarly, Rutherford et al. (2005) examined home sales in Texas and found that agent-owned houses did not sell faster than other houses but commanded a price premium of approximately 4.5%. Agarwal et al. (2019b) conducted a study on home sales in Singapore and demonstrated that real estate agents paid approximately 2.54% less for their own houses compared to other individuals. Furthermore, Xie (2017) investigated home sales in Indiana and discovered that agent-owned homes sold only 1.5% more than client-owned homes and had a comparable time on the market. Additionally, the observed large price discount for corporate or lender-owned homes may be attributed to the involvement of less experienced agents in these transactions.

To address potential concerns regarding changes in building quality and flipped sales, we re-estimated our main results based on the duration between the two sales. Typically, home renovations take between four and eight months in Sydney, and properties sold within two years are most likely to have been purchased as flipped.[10] Furthermore, we rely on the sale methods to address non-pecuniary benefits, experience of the agent, and agent-owner effects, which are more easily negotiated in private treaty sales but are more difficult in auction sales.

Table 7 presents the results of our analysis to address these concerns. Column (1) shows the results using the full sample, while Columns (2)-(5) show the results using sub-samples for pair sales that occurred within different durations, i.e., less than 2 years, between 2 and 6 years, between 6 and 10 years, and more than 10 years apart. The results show that using the same agency results in a similar return discount for all pair sales, with a 1.1% discount on returns for frequently traded properties in Column (2) and a 1.6% discount for properties held long-term in Column (5). However, interaction terms for the same agency dummy and the value of the property's non-salient features are statistically insignificant in Columns (2) and (5). In contrast,

[10] The duration is retrieved from https://renovationjunkies.com.au/how-long-does-it-take-to-renovate-a-house-2/.

for properties held for 2-6 years in Column (3) or 6-10 years in Column (4), coefficients on the same interaction term are positive and statistically significant. One possible explanation is that flipped or long-term holding properties are more likely to be significantly improved (renovated/rebuilt) before sale. When house features change, the benefit of using the same agency is significantly discounted.

Columns (6)-(7) present the results of our subsample analysis when controlling for selling methods. In Column (6), using the auction-auction subsample, the same agency results in a 2% discount on returns and the interaction effect of the same agency and value of the property's non-salient features is statistically insignificant. In contrast, the results of the negotiation-negotiation subsample analysis in Column (7) show a 1.3% discount on returns of using same agency and the interaction effect is positive and statistically significant. The results raise doubts about the effectiveness of using auctions as a means to effectively mitigate the agency problem. In auction sales, agents do not directly engage in price negotiations. Their optimal effort level is tied to the seller's reserve price, which represents the minimum selling price of a property. They then rely on peer effects or animal spirits in auctions to attain a final sale price (e.g., see Brannman, Klein & Weiss, 1987; Shi & Kabir, 2017). If a property remains unsold in auctions, agents may either attribute it to market conditions or attempt to convince the seller to lower their reserve price. Therefore, while auctions offer a competitive and transparent process, they also provide opportunities for agents to potentially reduce their roles and responsibilities in the transaction compared with their effort in private treaty. This agency problem may be more pronounced in repeated auction sales conducted by the same agency, as evidenced by the large agency discount observed in the auction-auction subsample compared to the negotiation-negotiation subsample in our study. Overall, our subsample analysis rules out other channels that may drive our results. We show that the return discount is exacerbated when the same agency is used for auctioned, flipped, or long-term holding properties.

<Insert Table 7 about here>

5.4 Controlling for the Acquisition Date and Disposition Date

To account for common time-varying effects between the acquisition and disposition dates, we follow the repeated-sale method (Bailey et al., 1963) and replace the calendar quarter-year dummies in equation (6) with a $n_{\times}$T matrix, where n is the total numbers of pair transactions and T is the total numbers of calendar-year. In the matrix, T_{it} is 1 if it indicates the second sale, -1 for the first sale, and 0 for no sale. The matrix should pick up common time-varying effects between two consecutive sales.

Table 8 shows the estimation results. Column (1) presents our main results based on equation (6), and Column (2) shows the results based on the alternative repeated-sale method. Comparing the results in Columns (1) and (2), we find the coefficients are similar and the adjusted R-squared in Column (2) is slightly higher. Therefore, our main findings remain robust to common time-varying effects between sales.

<Insert Table 8>

5.5 Neighbourhood Characteristics

Sydney is a diverse market. To further account for the different dynamics in local housing markets, we examine how neighbourhood characteristics may influence the principal's agency choices and pair sale returns, using census suburb (neighbourhood) demographics as a proxy. Kurlat and Stroebel (2015) demonstrated that neighbourhood characteristics can be a significant source of information in the housing market, which could mean that sellers in certain neighbourhoods are better informed than others when it comes to choosing an agency at the time of sale. Our findings indicate that sellers in senior and high-income neighbourhoods are more likely to avoid of choosing the same agency. Meanwhile, the positive interaction term on

agency value and household income implies that sellers in higher income neighbourhoods are more responsive to the agency value encountered in the purchase transaction. Additionally, our return analysis shows that hiring the same agency is more profitable in suburbs with more high-income and Australian citizens, but may result in lower returns in suburbs with higher levels of education. Full results are presented in Appendix B.

6 Conclusion

This paper studies the impact of agency choice on pair sale returns on residential properties in Sydney, Australia. To capture the agency value and non-salient features in each property transaction, we employ a hedonic regression model based on full market housing transaction data. Using these estimates, we develop a binary agency choice model to understand the principal's agency choice between the same agency that originally sold the house to them and a different agency in the next sale. We find that the seller's tendency to stay with the same agency is significantly influenced by the encountered agency value, the value of the property's non-salient features, and the current market share of the selected agency.

To investigate the financial consequence of using same agency, we employ the Heckman two-step method to analyse pair sale returns. Our results indicate that using the same agency results in a lower return (1.1-1.4%) compared to using a different agency. We further conducted a subsequent analysis that controlled for other factors such as TOM, duration, sale methods and common time effects between the first and second sales. Our findings suggest that the same agency discount is not driven by motivated sellers or agents, changes in building quality, flipped sales, non-pecuniary benefits, or agent-owner effects. Therefore, it is likely that the same agency tends to put in less effort during the sale process for repeated sales, due to the informational advantage with the same agency.

Our results have broader implications not only to the housing market but also for other industries, such as financial markets where people use stockbrokers for buying and selling shares and in the corporate business where people rely on consultants for financial services. While using the same agency is convenient for repeated business, it may not be financially in the interest of principals, as shown in the real estate brokerage market. Our findings suggest that perhaps principals can alleviate potential principal-agent problems through informed agency selection.

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Table 1: Summary statistics

Panel A: Sample statistics								
	Panel A1: Full sample used in the hedonic regression							
	N	Mean	Median	SD	N	Mean	Median	SD
	Houses				Units			
Sale price (AUD)	395,705	896,775	720,000	613,138	252,711	575,002	496,000	334,241
Number of bedrooms	395,705	3.493	3.000	0.869	252,711	2.124	2.000	0.682
Number of bathrooms	395,705	1.771	2.000	0.801	252,711	1.378	1.000	0.524
Number of car parks	395,705	1.416	1.000	1.042	252,711	0.997	1.000	0.672
Land area (m2)	395,705	741	581	1,488				
	Panel A2: Pair sale sample							
	Houses				Units			
Sale price (AUD)	80,344	1,079,475	865,000	698,006	56,554	636,949	560,000	335,581
Number of bedrooms	80,344	3.518	3.000	0.888	56,554	2.102	2.000	0.653
Number of bathrooms	80,344	1.841	2.000	0.829	56,554	1.341	1.000	0.502
Number of car parks	80,344	1.593	2.000	0.954	56,554	1.120	1.000	0.584
Land area (m2)	80,344	657	563	1,141				
Panel B: Main variables in the pair sale analysis								
Same agency dummy (yes=1, no=0)	136,898	0.209	0.000	0.406				
Purchase type (neg=1, auc=0)	136,898	0.696	1.000	0.460				
Sale duration (months)	136,898	59	53	34				
Property type (unit=1, house=0)	136,898	0.413	0.000	0.492				
Agency effect at purchase	136,898	-0.001	-0.004	0.094				
Value of non-salient features at purchase	136,898	-0.013	-0.011	0.200				

This table provides summary statistics for main variables used in our analysis, covering the Sydney metropolitan area from January 2001 to October 2017.

Table 2: Pair sales by agency choice and market share

	Same agency			Different agency		
	House	Unit	All	House	Unit	All
High market-share agency	12,754	8,939	21,693	37,967	24,641	62,608
	(78.46)	(72.51)	(75.89)	(59.24)	(55.72)	(57.80)
Low market-share agency	3,502	3,389	6,891	26,121	19,585	45,706
	(21.54)	(27.49)	(24.11)	(40.76)	(44.28)	(42.20)
Total	16,256	12,328	28,584	64,088	44,226	108,314

We define high market-share agencies as firms with an annual sales volume above the average in the suburb, and low market-share agencies as firms with a market share below the average in the suburb. The pair sales are split into two groups: those using the same agency and those using a different agency. We then calculate the number and percentage (in parentheses) of agency choices between house and unit transactions in each group.

Table 3: Pair sale analysis of agency choices

	(1)		(2)		(3)		(4)	
Dependent variable: same agency or not (1,0)								
Type of purchase method (C_{it-}^{+})	-0.023	**	-0.019	*	-0.019	*	-0.016	*
	(0.009)		(0.009)		(0.009)		(0.009)	
Purchase agency value (PA_{it-})	0.556	***	0.558	***	0.571	***	0.721	***
	(0.040)		(0.041)		(0.041)		(0.057)	
Purchase value of non-salient features ($VNSF_{it-}$)			0.129	***	0.112	***	0.113	***
			(0.020)		(0.020)		(0.021)	
$VNSF_{it-} \times PA_{it-}$					0.754	***	0.877	***
					(0.158)		(0.212)	
PA_{it-}^{2}							-1.877	***
							(0.317)	
$VNSF_{it-} \times PA_{it-}^{2}$							-0.352	
							(0.848)	
Log of sale duration (D_{it})	-0.320	***	-0.321	***	-0.321	***	-0.317	***
	(0.006)		(0.006)		(0.006)		(0.006)	
Sale agency market share ($SAMS_{it}^{+}$)	0.492	***	0.491	***	0.492	***	0.489	***
	(0.008)		(0.009)		(0.008)		(0.009)	
HHI index (HHI_{it})	1.196	***	1.161	***	1.156	***	1.177	***
	(0.077)		(0.077)		(0.075)		(0.074)	
Property type (T_{i}^{+})	0.114	***	0.112	***	0.112	***	0.111	***
	(0.008)		(0.008)		(0.009)		(0.008)	
Constant	0.104		0.108		0.108		0.226	
	(0.366)		(0.248)		(0.246)		(0.230)	
Postcode	Yes		Yes		Yes		Yes	
Quarter-year dummy	Yes		Yes		yes		yes	
No. of observations	136,898		136,898		136,898		136,898	
AIC	0.969		0.968		0.968		0.967	
Log likelihood	-66,009		-65,988		-65,978		-65,891	

In this table we present the probit model results of same agency choice based on the principal's purchase experience and current information of agency. The dependant variable is the same agency choice dummy. The principal's purchase experience is indicated by the type of purchase method (C_{it-}^{+}), the agency value (PA_{it-}) encountered by the principal in the purchase transaction, and the value of the property's non-salient features ($VNSF_{it-}$) at the time of purchase. The current information of the agency is indicated by the selected agency's market share ($SAMS_{it}^{+}$) at the time of sale. In addition, we control for the duration between the first and second sales (D_{it}), the local agency market concentration (HHI_{it}), property type (house vs. unit) (T_{i}^{+}), postcode and calendar quarter-year dummies. See Section 3.3 for a detailed description of how each variable is constructed. Bootstrapped standard errors of estimates are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Estimation results of using the same agency on pair sale returns

	(1)		(2)		(3)		(4)	
Dependent variable: log(sale price/purchase price)								
$Same\ agency_{it}^{+}$ (same=1, different=0)	-0.012	***	-0.012	***	-0.011	***	-0.014	***
	(0.001)		(0.001)		(0.001)		(0.001)	
Purchase value of non-salient features ($VNSF_{it-}$)			-0.276	***	-0.283	***	-0.261	***
			(0.005)		(0.006)		(0.006)	
$Same\ agency_{it}^{+} \times VNSF_{it-}$					0.033	***	0.035	***
					(0.013)		(0.012)	
Sale agency market share ($SAMS_{it}^{+}$)							0.111	***
							(0.005)	
log of sale duration (D_{it})	0.157	***	0.167	***	0.167	***	0.111	***
	(0.002)		(0.002)		(0.002)		(0.003)	
Property type (T_i^{+})	-0.052	***	-0.052	***	-0.052	***	-0.034	***
	(0.001)		(0.001)		(0.001)		(0.001)	
$Inv\ MR_{it}$	0.074	***	0.043	***	0.044	***	0.267	***
	(0.006)		(0.006)		(0.006)		(0.012)	
Constant	-0.327	***	-0.332	***	-0.333	***	-0.482	***
	(0.031)		(0.032)		(0.032)		(0.033)	
Postcode	Yes		Yes		Yes		Yes	
Quarter-year fixed effects	Yes		Yes		Yes		Yes	
No. of observations	136,898		136,898		136,898		136,898	
Adj. R-squared	0.510		0.549		0.549		0.558	

In this table we employ the Heckman two-step method to examine the financial benefit or cost of using the same agency. The dependent variable is the log of the property's sale price divided by its purchase price. We use the same agency dummy ($Same\ agency_{it}^{+}$) to indicate the financial impact of using the same agency, while the value of the property's non-salient features ($VNSF_{it-}$) reflects the property characteristics at the time of purchase, and the current agency's market share ($SAMS_{it}^{+}$) proxies to the quality of the selected agency firm. We further control for sale duration between pair sales (D_{it}), property type (house vs. unit) (T_i^{+}), postcode, and calendar quarter-year dummies in the model. The inverse Mills' ratio ($Inv\ MR_{it}$) is obtained from the probit model in Table 3 to account for potential selection bias in the first step of the Heckman method. See Section 3.4 for a detailed model description. Bootstrapped standard errors of estimates are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Estimation results for property's time on market (TOM)

	(1)		(2)	
Dependent variable: log of time-on-market				
$Same\ agency_{it}^{+}$ (same=1, different=0)	-0.003		-0.004	
	(0.004)		(0.004)	
Purchase value of non-salient features ($VNSF_{it-}$)	0.089	***	0.080	***
	(0.009)		(0.010)	
Sale agency market share ($SAMS_{it}^{+}$)	-0.053	***	-0.088	***
	(0.003)		(0.010)	
log of sale duration (D_{it})	0.002		0.024	***
	(0.003)		(0.006)	
Sale method (negotiation=1, auction=0)	0.066	***	0.067	***
	(0.004)		(0.004)	
Log of number of bedrooms	0.102	***	0.101	***
	(0.010)		(0.010)	
Log of number of bathrooms	0.138	***	0.137	***
	(0.008)		(0.008)	
Log of number of car space	0.059	***	0.058	***
	(0.005)		(0.005)	
Property type (T_i^{+})	-0.051	***	-0.059	***
	(0.005)		(0.005)	
$Inv\ MR_{it}$			-0.088	***
			(0.024)	
Constant	0.180	***	0.236	***
	(0.063)		(0.064)	
Postcode	Yes		Yes	
Quarter-year fixed effects	Yes		Yes	
No. of observations	120,093		120,085	
Adj. R-squared	0.089		0.089	

In this table we test the impact of using the same agency on a property's time-on-market using the pair sale sample. The dependent variable is the natural logarithm of the property's time-on-market measured in months. The effect of using the same agency is indicated by the dummy variable ($Same\ agency_{it}^{+}$). Property characteristics are controlled for by the value of the property's non-salient features ($VNSF_{it-}$) at the time of purchase, the natural logarithm of the number of bedrooms, the natural logarithm of the number of bathrooms, the natural logarithm of the number of car space, and property type (T_i^{+}). Land areas are excluded from the regression as they are not well recorded for apartment units. We further control for the sale agency's market share ($SAMS_{it}^{+}$), sale duration between the first and second sales (D_{it}), and the inverse Mills ratios ($Inv\ MR_{it}$) obtained in the probit model of Table 3. See Section 4.3 for a detailed model description. Column (1) is based on the OLS estimation and Column (2) is based on the Heckman two-step method. Bootstrapped standard errors of estimates are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Same agency choice around purchase agency value

	(1) Full sample		(2) [-10%, +10%]		(3) [-5%, +5%]		(4) [-2.5%, +2.5%]	
Dependent variable: same agency or not (1,0)								
Type of purchase method (C_{it-}^{+})	-0.019	*	-0.016		0.004		0.014	
	(0.010)		(0.010)		(0.012)		(0.012)	
Purchase agency value (PA_{it-})	0.558	***	0.811	***	0.851	***	0.129	
	(0.044)		(0.094)		(0.190)		(0.198)	
Purchase value of non-salient features ($VNSF_{it-}$)	0.129	***	0.125	***	0.103	***	0.151	***
	(0.020)		(0.022)		(0.028)		(0.027)	
Sale agency's market share ($SAMS_{it}^{+}$)	0.491	***	0.542	***	0.572	***	0.573	***
	(0.009)		(0.010)		(0.011)		(0.012)	
Log of sale duration (D_{it})	Yes		Yes		Yes		Yes	
HHI index (HHI_{it})	Yes		Yes		Yes		Yes	
Property type (T_i^{+})	Yes		Yes		Yes		Yes	
Postcode	Yes		Yes		Yes		Yes	
Quarter-year fixed effects	Yes		Yes		Yes		Yes	
Constant	Yes		Yes		Yes		Yes	
No. of observations	136,898		113,147		76,156		41,558	
AIC	0.968		0.984		0.994		1.003	
Log likelihood	-65,988		-55,389		-37,570		-20,543	

In this table we replicate our main estimation results in Table 3, using sub pair sale samples based on their agency values encountered by the principals at the time of purchase. Column (1) corresponds to our main estimation in Column (2) of Table 3, while Columns (2)-(4) are the results for the agency value within a +/-10%, +/-5% and +/-2.5% margin, respectively. Bootstrapped standard errors of estimates are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Subsamples analysis

	(1) Full sample		(2) <= 2 years		(3) 2 - 6 years		(4) 6 - 10 years		(5) >10 years		(6) Auc-Auc		(7) Neo-Neo	
Dependent variable: log(sale price/purchase price)														
$Same\ agency_{it}^{+}$ (same=1, different=0)	-0.014	***	-0.011	***	-0.014	***	-0.013	***	-0.016	**	-0.020	***	-0.013	***
	(0.001)		(0.002)		(0.001)		(0.002)		(0.007)		(0.003)		(0.001)	
Purchase value of non-salient features ($VNSF_{it-}$)	-0.261	***	-0.232	***	-0.237	***	-0.304	***	-0.304	***	-0.277	***	-0.259	***
	(0.006)		(0.015)		(0.008)		(0.011)		(0.019)		(0.013)		(0.010)	
$Same\ agency_{it}^{+} \times VNSF_{it-}$	0.035	***	-0.030		0.044	***	0.069	***	-0.037		0.027		0.064	***
	(0.012)		(0.028)		(0.016)		(0.018)		(0.076)		(0.027)		(0.015)	
Sale agency market share ($SAMS_{it}^{+}$)	0.111	***	0.061	***	0.097	***	0.124	***	0.087	***	0.116	***	0.115	***
	(0.005)		(0.013)		(0.006)		(0.009)		(0.021)		(0.013)		(0.008)	
log of sale duration (D_{it})	0.111	***	0.021	***	0.106	***	0.220	***	0.744	***	0.130	***	0.085	***
	(0.003)		(0.008)		(0.005)		(0.009)		(0.024)		(0.008)		(0.005)	
Property type (T_i^{+})	-0.034	***	-0.039	***	-0.027	***	-0.029	***	-0.088	***	-0.028	***	-0.009	***
	(0.001)		(0.003)		(0.002)		(0.003)		(0.006)		(0.004)		(0.002)	
$Inv\ MR_{it}$	0.267	***	0.141	***	0.233	***	0.286	***	0.194	***	0.292	***	0.282	***
	(0.013)		(0.035)		(0.016)		(0.023)		(0.050)		(0.033)		(0.020)	
Postcode	Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Quarter-year fixed effects	Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Constant	Yes		Yes		Yes		Yes		Yes		Yes		Yes	
No. of observations	136,898		20,552		74,550		33,993		7,803		26,123		66,791	
Adj. R-squared	0.558		0.257		0.450		0.559		0.526		0.496		0.602	

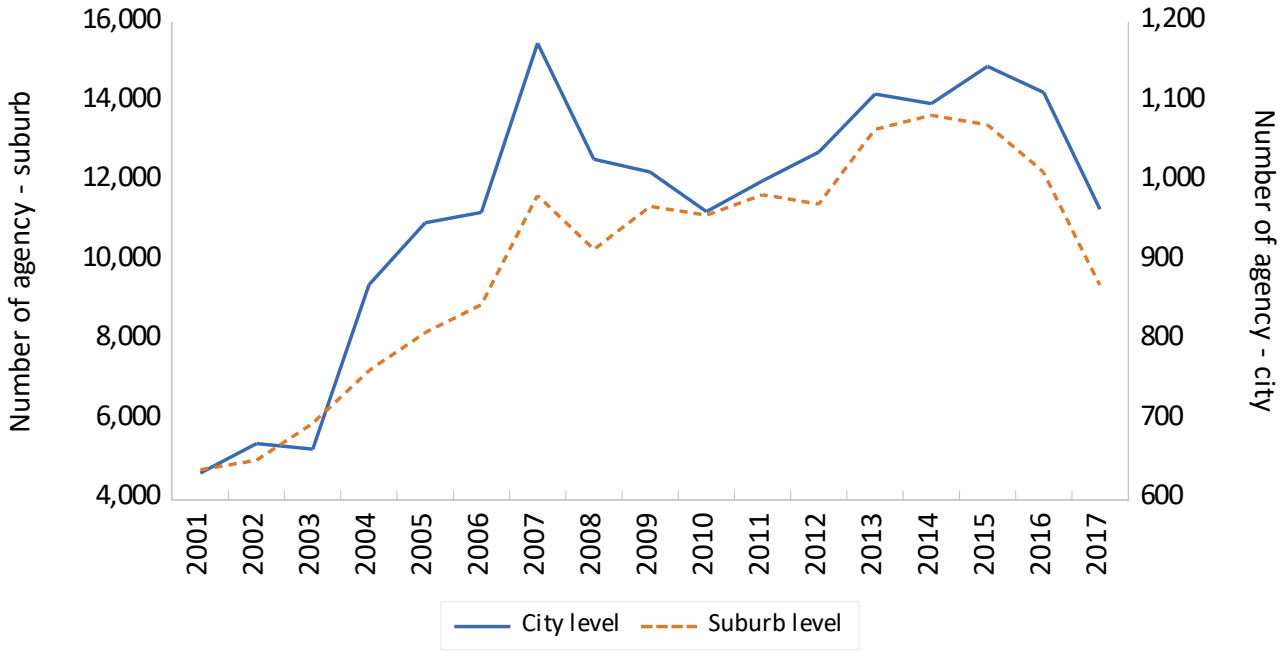
This table replicates the main results in Table 4 by using sub pair sale samples to address changes of building quality, flipped sales and other factors that may affect the same agency discount. Column (1) presents results for the full sample, while Columns (2)-(5) report results for pair sales within 2 years, 2-6 years, 6-10 years and more than 10 years, respectively. Columns (6) shows results for auction-auction sales, and Column (7) presents results for negotiation-negotiation sales. Bootstrapped standard errors of estimates are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Simultaneously control for the acquisition and disposition dates

	(1)		(2)	
Dependent variable: log(sale price/purchase price)				
$Same\ agency_{it}^{+}$ (same=1, different=0)	-0.014	***	-0.014	***
	(0.001)		(0.001)	
Purchase value of non-salient features ($VNSF_{it-}$)	-0.261	***	-0.259	***
	(0.006)		(0.006)	
$Same\ agency_{it}^{+} \times VNSF_{it-}$	0.035	***	0.032	***
	(0.012)		(0.012)	
Sale agency market share ($SAMS_{it}^{+}$)	0.111	***	0.116	***
	(0.005)		(0.005)	
log of sale duration (D_{it})	0.111	***	0.134	***
	(0.003)		(0.004)	
Property type (T_i^{+})	-0.034	***	-0.037	***
	(0.001)		(0.001)	
$Inv\ MR_{it}$	0.267	***	0.274	***
	(0.013)		(0.013)	
Postcode	Yes		Yes	
Quarter-year dummies	Yes		No	
Constant	Yes		Yes	
n x T matrix	No		Yes	
No. of observations	136,898		136,898	
Adj. R-squared	0.558		0.577	

This table replicates the main estimation results in Table 4, controlling for the acquisition and disposition dates. Column (1) is from our main estimation in Column (4) of Table 4. In Column (2) we replace the calendar quarter-year dummies with a $n_{\times}$T matrix, where *n* is the total numbers of pair transactions and T is the total numbers of calendar-year. In the matrix, T_{it} is 1 if it indicates the second sale, -1 for the first sale, and 0 for no sale. The matrix should capture common time-varying effects between two consecutive sales. Bootstrapped standard errors of estimates are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Figure 1: The number of agency firms in the Sydney metropolitan area



Appendix A: Data Cleaning and Hedonic Model

To remove outliers, we used the top 99.5% as an upper bound and bottom 0.5% as a lower bound for each variable. We further restricted the house sale sample as: (1) 1<=number of bedrooms <=6; (2) 1<=number of bathrooms<=5; (3) number of carpark space <=6; (4) 76 sqm<= land area<=21,370 sqm; and (5) AUD 146,000 <=contract price <=AUD 4,900,000; the unit sale sample as: (1) 1<=number of bedrooms <=4; (2) 1<=number of bathrooms <=3; (3) number of carpark space <=4; and (4) AUD 120,000 <= contract price <=AUD 3,175,000. We dropped unit land area from the analysis as it is not accurately estimated in the dataset.

We then employed a hedonic model for houses and units separately to estimate the agency value and the value of the property's non-salient features in each transaction. The agency value was estimated using the agency-district-year fixed effect and the value of the property's non-salient features was estimated as the residual term in each transaction. Table 9 presents the results of the hedonic regression, which show an adjusted R-squared is 0.859 in the house price regression and 0.796 for units, indicating a good explanatory power of the model. Further analysis shows that the agency value accounts for about 10% of unexplained variation in property sale prices in Table 3.[11]

Table 9: Estimating the agency value and the value of the property's non-salient features

	House		Unit	
Dependent variable: log of sale price				
log of number of bedrooms	0.296	***	0.511	***
	(0.002)		(0.002)	
log number of bathrooms	0.213	***	0.266	***
	(0.001)		(0.002)	
log number of car parkings	0.045	***	0.078	***
	(0.001)		(0.002)	
log land area (sqm)	0.188	***		

[11] We first carry out the above hedonic price analysis without agency to obtain residuals and then we regress the residuals obtained in the first step on a constant and agency fixed effect. The value of R squared is about 10% for both house and unit regressions.

	(0.002)			
Constant	10.876	***	11.431	***
	(0.030)		(0.257)	
Agency-district-year fixed effects	Yes		Yes	
Postcode fixed effects	Yes		Yes	
Quarter-year fixed effects	Yes		Yes	
No. of observations	395,705		252,711	
Adj. R-squared	0.859		0.796	

In this table we regress property transaction price in natural logarithm on the log of the number of bedrooms, the log of number of the bathrooms, the log of number of the car parkings and the log of land areas (for houses), controlling for agency-district-year fixed effects, postcode and calendar quarter-year dummies. The agency value is measured by the agency fixed effect and the regression residual is taken as the value of the property's non-salient features. Standard errors of estimates are in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Appendix B: Neighbourhood demographic factors on agency choices and pair sale returns

Suburb level demographic data for the greater Sydney area was obtained from the Australian Bureau of Statistics for three census waves (2006, 2011, and 2016). We focused on variables such as median age, percentage of Australian citizens, percentage with a higher education degree, and median household income. The census data was interpolated for the study period (2001-2017), and the demographic data was matched by suburb and year to the micro-level property sale data. In total there are 658 suburbs, which covers all suburbs in the greater Sydney area.

Table 10: Neighbourhood demographics and agency choice

	(1)		(2)		(3)	
Dependent variable: same agency or not (1,0)						
Type of purchase method (C_{it-}^{+})	-0.017		-0.017		-0.016	
	(0.010)		(0.009)		(0.011)	
Purchase agency value (PA_{it-})	0.725	***	0.734	***	-2.687	*
	(0.060)		(0.060)		(1.552)	
PA_{it-}^{2}	-1.825	***	-1.833	***	-1.898	***
	(0.352)		(0.310)		(0.369)	
Purchase value of non-salient features ($VNSF_{it-}$)	0.147	***	0.129	***	0.130	***
	(0.021)		(0.021)		(0.024)	
Suburb - Australian citizen (%)	0.160		0.163		0.173	
	(0.145)		(0.132)		(0.129)	
Suburb - higher education (%)	0.325		0.313		0.353	
	(0.416)		(0.284)		(0.355)	
Suburb - log of median age (years)	-0.187	*	-0.192	***	-0.201	**
	(0.093)		(0.056)		(0.099)	
Suburb - log of median household income (AUD)	-0.180	***	-0.178	***	-0.178	***
	(0.041)		(0.025)		(0.036)	
$PA_{it-} \times VNSF_{it-}$			0.802	***	0.776	***
			(0.213)		(0.222)	
PA_{it-} × Log of median household income					0.458	**
					(0.212)	
Log of sale duration (D_{it})	-0.319	***	-0.319	***	-0.320	***
	(0.006)		(0.006)		(0.006)	
Sale agency market share ($SAMS_{it}^{+}$)	0.487	***	0.487	***	0.486	***
	(0.009)		(0.009)		(0.008)	
HHI index (HHI_{it})	1.404	***	1.399	***	1.393	***
	(0.109)		(0.171)		(0.101)	
Property type (T_{i}^{+})	0.107	***	0.108	***	0.108	***
	(0.011)		(0.009)		(0.012)	
Postcode	Yes		Yes		Yes	
Quarter-year fixed effects	Yes		Yes		Yes	
Constant	Yes		Yes		Yes	
No. of observations	133,467		133,467		133,467	
AIC	0.964		0.964		0.964	
Log likelihood	-64,055		-64,046		-64,042	

Table 11: Neighbourhood demographics and pair sale returns

	(1)		(2)	
Dependent Variable: Log(sale price/purchase price)				
$Same\ agency_{it}^{+}$ (same=1, different=0)	-0.014	***	0.003	
	(0.001)		(0.049)	
Purchase value of non-salient features ($VNSF_{it-}$)	-0.253	***	-0.261	***
	(0.005)		(0.006)	
Suburb - Australian citizen (%)	-0.057	***	-0.066	***
	(0.016)		(0.015)	
Suburb - higher education (%)	-0.344	***	-0.315	***
	(0.047)		(0.048)	
Suburb - log of median age (years)	0.037	***	0.044	***
	(0.012)		(0.012)	
Suburb - log of median household income (AUD)	0.020	***	0.023	***
	(0.005)		(0.005)	
$Same\ agency_{it}^{+} \times VNSF_{it-}$			0.036	***
			(0.012)	
$Same\ agency_{it}^{+}$ × Australian citizen			0.038	***
			(0.014)	
$Same\ agency_{it}^{+}$ × Higher education			-0.150	***
			(0.042)	
$Same\ agency_{it}^{+}$ × Median age			-0.001	
			(0.013)	
$Same\ agency_{it}^{+}$ × Median income			0.000	
			(0.004)	
Sale agency market share ($SAMS_{it}^{+}$)	0.111	***	0.111	***
	(0.005)		(0.005)	
log of sale duration (D_{it})	0.110	***	0.110	***
	(0.003)		(0.003)	
Property type (T_i^{+})	-0.032	***	-0.032	***
	(0.002)		(0.002)	
$Inv\ MR_{it}$	0.269	***	0.268	***
	(0.013)		(0.013)	
Postcode	Yes		Yes	
Quarter-year fixed effects	Yes		Yes	
Constant	Yes		Yes	
No. of observations	133,467		133,467	
Adj. R-squared	0.558		0.559	