The Real Effects of Household Financial Constraints: When Money Moves In*

Darren Aiello† Jason Kotter‡ Gregor Schubert§

December 29, 2023

Abstract

What effects do household financial constraints have on housing markets? Using a novel dataset tracking households across home purchases, we demonstrate that relaxed financial constraints lead households to substitute away from costly information acquisition and toward paying more for their next house. An exogenous dollar of housing equity causes movers to pay a $0.06 premium after adjusting for neighborhood price trends and time-varying property quality. In aggregate, less financially constrained households relocating to an area cause upward regional price pressure—a 10% increase in equity gain amongst incoming movers leads to 0.4 percentage point higher house price growth.

KEYWORDS: Household finance, financial constraints, migration, real estate.

JEL CLASSIFICATION: G51, D83, R31, D10.

*We thank Bronson Argyle, Stuart Gabriel, Mark Garmaise, Andra Ghent, Marco Giacoletti (discussant), Chris Hair, Barney Hartman-Glaser, Benjamin Iverson, Mahyar Kargar, Seohee Kim (discussant), Pavel Krivenko (discussant), Lu Liu, Taylor Nadauld, Christopher Palmer, Ryan Pratt, Christophe Spaenjers (discussant) and conference and seminar participants at the AREUEA National Conference, Boston College, BYU, European Meeting of the Urban Economics Association, FRBSF-UCLA Housing and Financial Markets Conference, Oxford Said, and UCLA Anderson for comments and suggestions, as well as Michael Flores for his excellent research assistance. We also thank the UCLA Ziman Center's Rosalinde and Arthur Gilbert Program in Real Estate, Finance, and Urban Economics for their generous support. Previous versions of this paper were circulated under the title, "Housing Wealth and Overpayment: When Money Moves In." All errors are our own responsibility.

†Brigham Young University; d.a@byu.edu

‡Brigham Young University; jasonkotter@byu.edu

§University of California, Los Angeles; gregor.schubert@anderson.ucla.edu

1 Introduction

Expansions in mortgage credit, and the accompanying relaxation of financial constraints, play an important role in housing boom and bust cycles (Mian and Sufi, 2009; Adelino, Schoar, and Severino, 2016). We add to this literature by using a large, new, nationally representative sample of homeowner moves to document a surprising fact: relieving a household's financial constraints upon the sale of their existing home causes them to pay a premium for their next house relative to its expected value. We provide evidence in favor of a novel mechanism for this effect: relaxed financial constraints cause households to substitute away from costly search and information acquisition in the housing market and towards paying higher prices for their homes. Finally, we show that less financially constrained households relocating to an area cause upward price pressure at the regional level.

In our setting, the primary financial constraint households face is on their ability to borrow to buy a house. While our sample of homeowners likely skews toward higher income households, the typical homeowner is still constrained in their home purchase decision by the size of the mortgage that they qualify for. We show that households that receive a plausibly exogenous equity gain when selling their house experience relaxed financial constraints—they receive easier access to more credit on their next home purchase. These less constrained households pay a premium for their next house, incurring both financial costs (lower future realized returns on the property) as well as opportunity costs (could have bought a nicer house or saved the extra money).

Given these costs, why do households use their equity gains to pay a premium? We explore a number of different channels that might explain our findings. Our evidence suggests that less financially constrained households pay more for their next housing purchase because they substitute away from the costly time and effort required to acquire information about particular housing markets, in line with findings by Kurlat and Stroebel (2015) that there is a trade-off between how informed a buyer is and the price premium paid in a housing transaction.

These higher transaction prices, more reflective of information about the buyers' balance sheet than they are of housing market dynamics, represent a less informative pricing signal to the broader market. What effect does this have on the household's new neighbors? We provide suggestive evidence that a purchase by a household with a larger equity gain is associated with increased prices for properties in the nearby neighborhood. We then present causal evidence that the aggregate inflows of less financially constrained households spill over to commuting-zone-level house prices. Consequently, household financial constraints not only have important effects on individual household investment decisions and the trade-off between financial resources and information acquisition, but also influence broader housing market dynamics in the (potentially distant) purchase location. This can play an important role in the dynamics and propagation of housing boom and bust cycles, creating a positive feedback loop between increased credit for previously constrained households and increasing house prices.

We begin by constructing a novel dataset of household moves based on the Zillow Transactions and Assessments (ZTRAX) data. We focus on moves between owner occupied single-family residential properties between 1996 and 2021 where we observe three specific transactions—the purchase and sale of a particular property (the "sold property"), as well as the purchase of the subsequent property (the "purchased property"). This allows us to measure, over the individual household's holding period, the increase in the value of their housing asset (their "equity gain"). We examine how households that experience relaxed financial constraints through larger equity gains change their observed behavior in their subsequent housing purchase. For that subsequent purchase, we recover the residual (the "price premium") from a repeat sales regression model that controls for both time invariant observable and unobservable property characteristics as well as time-varying census tract average price levels, measured with respect to the entire universe of housing transactions in the ZTRAX data.

This price premium is designed to only contain information about the purchase price that is orthogonal to an objective measure of the quality and neighborhood trend adjusted value of the asset. However, it is still possible that a portion of this premium reflects increases in house quality due to recent property renovations that are unobservable in our repeat-sales model. To allay these concerns, we augment our data with a database covering all residential renovation permits. We find no evidence that high equity gain households are more likely to buy recently renovated houses, and controlling for the number and value of recently completed renovation permits does not meaningfully change our estimates. Additionally, we show that a larger price premium negatively predicts future realized equity gains on the purchased property, which is inconsistent with the measured premium reflecting persistent changes in the valuation of the purchased property. Together, this evidence suggests that price premia are not driven by time-varying property quality.

Assessing the causal effects of a household's equity gain is challenging for two reasons. First, households that realize a large equity gain are likely to be more sophisticated or skilled (or have hired better real estate agents) and would therefore be less likely to pay a premium for their new house. The existence of sophisticated housing market participants biases downward any naïve estimate of the effect of the equity gain on the price premium. Second, potential co-movement in housing prices across the sale and purchase locations can bias upward any estimates of the effect of equity gain at sale on outcomes related to the price paid at purchase. Ultimately, while our measure of the price premium is orthogonal to most local price movements of concern, this will make it difficult to identify the spillover effects of equity gains on neighborhood prices.

To address these concerns, we develop an instrumental variable strategy using the change in the zip code median house price over the household's holding period as an instrument for a household's equity gain. The change in overall prices in the sale location is orthogonal to any individual household's (or their agent's) housing market sophistication or bargaining ability. We further include a rich set of controls and fixed effects to control for differences in the types of households that move and potential co-movement in prices across move locations. The holding period change in zip house prices strongly predicts a household's equity gain—first-stage F-statistics are well above 100. The exclusion restriction is that, conditional on the fixed effects and controls, the change in housing prices in the zip code of the sold property is uncorrelated with the amount the buyer pays above the current quality and neighborhood trend adjusted value of the purchased property (measured relative to the purchase census tract-month) except through the household's equity gain.

In addition to exploring the relation between equity gains and price premia, we also characterize how a relaxation of financial constraints as a result of higher housing wealth affects other dimensions of the purchase decision. Buyers with larger equity gains spend more on a house, both because they purchase a property in a more expensive zip code and because they buy a bigger house. We find that for each dollar of equity gain, households spend $0.87 more on their next house. Although households take on additional debt in addition to their their equity gain to make this purchase—a dollar of equity gain increases their next mortgage by about $0.53—on net, the increase in housing wealth leads households to de-lever and their combined loan-to-value (LTV) ratio falls. The fact that large equity gains allow households to buy more expensive houses with lower LTV ratios suggests that equity gains meaningfully alleviate household financial constraints. Consistent with more financial flexibility, we also find that these households are more likely to renovate their house immediately after moving in.

While these changes in household consumption and financing are important, it is perhaps unsurprising that a constrained household uses a shock to housing wealth to increase housing consumption and to de-lever. More interesting is the change in the premium paid for these purchases. We find that for every dollar of exogenous equity gain that a seller receives, they pay a 6 cent premium for their next house. For the average equity gain in our sample, that represents a premium of about 1.6 percent of the overall purchase price, or $5,900.

What leads buyers to use their equity gains in this way? We test multiple hypotheses. First, high equity gain households might avoid costly information gathering because they have overly optimistic beliefs about future house prices. For example, a household might base the offer price for their purchased property on the sale price of their sold property (Simonsohn and Loewenstein, 2006; Andersen, Badarinza, Liu, Marx, and Ramadorai, 2022). We find evidence that this benchmarking behavior exists in our data, as households that move from high price areas to lower price areas pay a higher premium on average. However, the effect of equity gains on price premia persists even after controlling for benchmarking. Moreover, conditional on the dollars gained in the transaction, households with a higher return on equity (which might influence their beliefs about future housing returns) do not pay a different premia. Consequently, differences in beliefs driven by experienced returns to housing or benchmarking do not appear to explain our result.

Second, the relief of financial constraints by equity gains likely impacts the search behavior of households. Gargano, Giacoletti, and Jarnecic (2020) show that local area price appreciation causes capital constrained homeowners in that area to search across a broader set of prospective properties (potentially leading to a better match), while not changing the amount of attention devoted to any particular listing and spending less time overall searching (potentially resulting in less information acquisition). Both channels through which search behavior is impacted by the relief of financial constraints are consistent with equity gains causing higher price premia. Searching across a broader set of properties could potentially lead to finding a better match, resulting in a household paying a premium for a house for which they have a higher private valuation. Alternatively, because housing markets are segmented and illiquid, acquiring information about the value of a property is costly and so buyers who are less financially constrained might be more likely to trade off expending that effort with simply paying more.

We distinguish between these two types of search behavior by investigating how the sensitivity of price premia to equity gains varies based on the characteristics of the moving household and the neighborhood. For the subset of within-county moves ("local moves"), households that have lived in their sold home for a longer period of time are both more likely to be familiar with the area—thus facing a bigger information advantage relative to their less-tenured neighbors—and to have more strongly developed local housing preferences, perhaps due to more specific community ties. We find that the sensitivity of the premium to their equity gains is lower for long-tenured local movers, consistent with less financially constrained households being more likely to pay a premium when they face relative information disadvantages. Importantly, this is also inconsistent with higher-equity-gain households paying a premium due to stronger area-specific preferences. We further investigate how the sensitivity of the price premium to equity gains varies in our full sample by constructing proxies for the degree of information asymmetry in the market. We find that households are more likely to use their equity gain to pay a premium in markets with fewer or noisier comparable transactions. This evidence suggests that relaxed financial constraints allow movers to substitute costly information acquisition with paying a premium instead.

Having established that equity gains cause buyers to pay a premium, we next examine what happens to neighborhood house prices when a household with large equity gains moves in. We show that the equity gain a buyer realized on their recently sold home is related to an increase in average housing prices over the next year in the nearby neighborhood—6.8 cents for every dollar of equity gain. While this suggests that the premium paid by an incoming household spills over to their neighbors' prices, this analysis is complicated by the fact that households endogenously choose where to move. This makes it difficult to separate out any spillover effect from other neighborhood characteristics that might draw future additional high equity households to the neighborhood.

Given this limitation, we turn to a different specification better suited to identify the spillover effects of the arrival of less financially constrained movers on aggregate house price growth. For this analysis, we focus on the effect of aggregate out-of-area equity gain inflows on destination commuting zone house price growth. Estimating the causal impact is challenging because households tend to move more between areas with highly correlated house prices (Sinai and Souleles, 2013). As a result, we need to identify exogenous inflows of equity gains. We do this using predicted equity gain inflows based on historical migration routes calculated using IRS data, similar to Schubert (2021). We show that the cumulative effect of higher equity gain inflows is to drive up local house price growth, with 10% higher equity gains among incoming movers associated with an increase in local house price growth of ~0.4 percentage points. While our study is able to measure the causal impact of non-local equity gain moving into an area, the effects of equity gains on local house prices amongst households moving locally are also likely large and significant, albeit impossible to separate from local persistence in housing price growth. Together, our results show that the relaxation of household financial constraints through housing equity gains not only impacts household investment decisions, but also has real effects on prices in the areas where they purchase homes.

Our paper contributes to a large literature exploring the existence of information asymmetries in real estate markets.[1] Across both commercial and residential real estate, as well as mortgage originations, less informed buyers pay a premium (Chinco and Mayer, 2016; Lambson, McQueen, and Slade, 2004; Agarwal, Sing, and Wang, 2018; Bhutta, Fuster, and Hizmo, 2019). Households with higher wealth also face a bargaining disadvantage that results in paying higher prices on average (Cvijanović and Spaenjers, 2021). We expand on these results by showing that households, faced with information asymmetries, use their housing wealth to trade off the costs of becoming informed with paying a premium for their next property. This is broadly consistent with Caplin and Dean (2015) who argue that choice "mistakes" are actually a rational response to costly information acquisition.

We also contribute to the literature exploring migration and house price dynamics (Jia, Molloy, Smith, and Wozniak, 2023). Howard (2020) and Schubert (2021) show that domestic migration flows predicted by historical links can impact local housing market dynamics, while Badarinza and Ramadorai (2018), Gorback and Keys (2020), Li, Shen, and Zhang (2020), and Davids (2020) show that capital inflows related to foreign ownership drive up local house prices. We differ from this literature by focusing on the housing wealth of movers within the U.S., and show that the house price impact of migration varies with the equity gains of migrants, consistent with the model presented in Favilukis and Van Nieuwerburgh (2021).

Finally, our paper's ability to track households across multiple home purchases allows us to contribute relative to a literature exploring the role and behavior of buyers (Gargano, Giacoletti, and Jarnecic, 2020; Reher and Valkanov, 2021; Han and Hong, 2022), sellers (Guren, 2018; Andersen et al., 2022; Fu, Jin, and Liu, 2022; Giacoletti and Parsons, 2021; Cortés, Singh, Solomon, and Strahan, 2022), their agents (Aiello, Garmaise, and Nadauld, 2022), and participants' over-

[1] See, e.g., Garmaise and Moskowitz (2004); Kurlat and Stroebel (2015); Rutherford, Springer, and Yavas (2005); Levitt and Syverson (2008).

all performance (Chambers, Spaenjers, and Steiner, 2021; Wolff, 2022) in residential real estate. Our new panel of household housing market behavior allows us to study links between different transactions by the same household over time for a large and geographically diversified sample of home purchases.

2 Data and Matching

To estimate the effect of equity gains on subsequent housing decisions, we first construct a novel dataset of household moves based on the Zillow Transactions and Assessments (ZTRAX) data. The ZTRAX data is based on property deeds and covers the entire U.S. We begin with the ZTRAX universe of 220 million house transactions that occur between 1996 and 2021. We then limit the sample to owner-occupied single family residences and exclude transactions with institutional names recorded on the deed to filter out investors as well as vacation properties.

Within this subset of 111 million transactions, we identify potential moves by matching based on names, mailing addresses, and property addresses listed on the recorded deeds. To qualify as a move in our data, the purchase transaction needs to occur less than 274 days after, but no more than 182 days before, the sale transaction.[2] We privilege the strongest name match available (e.g., matches based on multiple names listed on both deeds), only retaining matches that have unique "strongest" match pairs in order to effect the most conservative match possible. This matching process results in a set of 19.8 million moves, for an overall match rate of 17.8%.[3] Appendix Section A.1 analyzes the quality and coverage of our matching process.

Because we are interested in the effects of equity gain on a subsequent price premium, we limit our sample to transactions where we observe three consecutive prices—the original purchase and subsequent sale price of the sold property, as well as the price of the next purchased property.

[2]Deeds are recorded in a manner that bunches on particular days of the week. These cut-offs are chosen to represent round week day counts for three-quarters and one-half of a year, respectively.

[3]Our match is limited to homeowner to homeowner moves, which necessarily excludes first-time buyers and any owner transitioning to or from the rental market. Using statistics from the National Association of Realtors covering 2003-2021, we estimate that we match around 26.2% of non-first time buyer transactions.

This restriction excludes moves to or from non-disclosure states.[4] We further limit the sample to transactions where all three prices are greater than $30,000 and less than $2 million, occur on a property that was never subject to a foreclosure, and where we are able to calculate all relevant inputs into our regression model. After excluding fixed effect singletons, this results in a final regression sample of 2.9 million moves.

Figure 1 shows a map of the zip codes in our data where households purchase homes. Importantly, our sample covers a broad cross-section of the U.S. Table 1 presents summary statistics of the variables used in our regression sample.

2.1 Definition of Equity Gain

Our main explanatory variable of interest is a household's equity gain on their sold property, which we define as the change in the value of the house over the length of ownership, i.e.,

$$EquityGain_{i,t} = P^S_{i,t} - P^S_{i,t-tenure} \tag{1}$$

where $P^S_{i,t-tenure}$ is the original purchase price that household i paid for the property being sold, and $P^S_{i,t}$ is the price that the property sells for at time t, the time of the move.

This measure of equity gain represents the change in the house's asset value, and is broadly a measure of the change in the household's housing wealth, which we use as our proxy for lower financial constraints when purchasing another home. In our sample, the average household lives in a property for 6.6 years before selling and realizes an average equity gain of $86,244.

[4] Non-disclosure states are Idaho, Kansas, Mississippi, Montana, New Mexico, Texas, Utah, Wyoming, and all counties in Missouri except for Jackson County, St. Charles County, St. Louis County, and St. Louis city.

2.2 Definition of Price Premium

We define the price premium as the price residual from a repeat-sales model estimated over the entire ZTRAX database of over 72 million housing transactions. Specifically, we estimate:

$$\begin{aligned} P_{i,t} &= \alpha_i + \alpha_{n,m} + \varepsilon_{i,t}^{Price} \\ PricePremium_{i,t} &= \varepsilon_{i,t}^{Price} \end{aligned} \tag{2}$$

where $P_{i,t}$ is the price of property i purchased at time t, α_i is a property-level fixed effect, $\alpha_{n,m}$ is a fixed effect for the census tract by month of the property being purchased. We refer to the residual from this model, $\varepsilon_{i,t}^{Price}$, as the price premium.

This measure of the price premium accounts for any time-invariant differences in characteristics between properties though property-level fixed effects and captures any changes in property value arising from neighborhood-level trends through census-tract-by-month fixed effects. Note that these fixed effects control for house price trends within quite small geographic areas: census tracts are generally smaller than zip codes and are meant to contain about 4,000 people.

Consequently, we interpret the price premium as the amount paid in excess of a reasonably objective measure of the current quality and neighborhood trend adjusted value of the property. The one challenge with this interpretation is that our baseline data do not allow us to observe changes in property characteristics over time (such as renovations or additions). In Section 4.2, we address this limitation by combining our data with renovation permit data to control for any time-varying changes in property quality. Mechanically, the average price premium in the repeat-sales sample is zero (see Panel A of Table 1). However, the average price premium in our sample of household moves is about $11,500, with the interquartile range extending from -$17,500 to $31,200 (or -6.4% to 9.7% of the purchase price). The non-zero average price premium in our regression sample is not a problem for the internal validity of our results, but does suggest potential selection that might matter for out-of-sample extrapolation. This selection is likely a result of the fact that we are only able to identify homeowner-to-homeowner transactions.

This prevents us from observing first-time home buyers, who are more likely to be financially constrained and thus less able to pay a premium when purchasing. Given this selection, one should be cautious in extrapolating our results beyond homeowner-to-homeowner purchases.

3 Empirical Strategy

In this section, we introduce a strategy to identify the causal effect of relaxing a household's financial constraints, which occurs through realizing an equity gain when selling a house, on subsequent housing purchases. We begin by estimating regression models of the following form:

$$PricePremium_{i,t} = \beta\, EquityGain_{i,t} + \phi' \Gamma_{i,t} + \varepsilon_{i,t} \tag{3}$$

where $PricePremium_{i,t}$ is the dollar amount the household pays on their next purchased home relative to a quality and neighborhood trend adjusted price (defined in Equation 2), $EquityGain_{i,t}$ is the dollar change in house price the household experienced over the years lived in their sold home (defined in Equation 1), and $\Gamma_{i,t}$ represents control variables at the property or area level and any included fixed effects. Throughout the paper, we cluster our standard errors by both year and purchase county separately to account for potential correlation both within and across county-level housing markets.

For Equation 3 to recover the causal effect of equity gains on the price premium, it is necessary that the household's equity gain in their previous home is uncorrelated with any unobserved, price-relevant characteristics of the transaction. There are two reasons that this is unlikely to be the case. First, Sinai and Souleles (2013) show that prices tend to be highly correlated across move origin and destination locations. This implies that households that experience a high equity gain are likely to purchase a home that has a higher price. To alleviate concerns over simultaneous movement in prices we include zip-year fixed effects separately for both the sold and purchased property locations. These fixed effects control for the timing of the move and absorb house price dynamics surrounding both the sold and purchased properties. We further show robustness to adding an additional fixed effect for purchase county by sale county by year. This specification has the advantage of better controlling for co-movement in house prices by ensuring that we compare households moving from the same county to the same county in the same year, but comes at the cost of a substantial reduction in sample size.[5] Combined, these fixed effects make it unlikely that our results are biased by co-movement in house prices.

The primary remaining source of endogeneity is that households are likely to have varying amounts of housing market sophistication due to differences in experience, bargaining ability, and the quality of real estate agents. A more sophisticated household is likely to both receive a higher price when selling a house (and thus realize a larger equity gain) and also pay a lower price when buying a house (and thus be less likely to pay a premium relative to the quality and neighborhood trend adjusted price for the home). To the extent housing market sophistication is common, this will bias our OLS estimates downward.

The ideal experiment to identify the effect of housing equity gains on subsequent purchase decisions would be to randomly assign different equity gains to two otherwise identical households that are selling a house at the same time and location. We would then require these households to move to the same randomly chosen place and purchase a house at the same time. In this setting, co-movement in house prices across locations is not a concern because both the treated and control households are exposed to the same price dynamics. While it is not feasible to actually run this experiment, we approximate it using the following instrumental variables strategy.

Instrumental variable. We isolate variation in equity gains that is plausibly exogenous to idiosyncratic household choices by constructing an instrument for a household's equity gain. This instrument is defined as the change in the median zip code house price over the years that the household lived in the home,

$$\Delta \text{HPI}^S_{z,t} = \text{HPI}^S_{z,t} - \text{HPI}^S_{z,t-tenure} \tag{4}$$

[5] In Appendix Table A.1 column (3), we also find that our main results are robust to including census tract-year FE for both the purchase and sale location.

where $\text{HPI}^S_{z,t}$ is the median sold house price in the full ZTRAX sample for the zip code of the sold property at the time that the house is sold, and $\text{HPI}^S_{z,t-tenure}$ is the median sold house price at the time that the house was originally purchased. By using local area house price appreciation as an instrument for equity gain, we exclude any variation in a household's equity gain that is due to their bargaining ability or other market sophistication.[6]

To help ensure that treated and control households are as similar as possible, we include a set of controls/fixed effects to account for differences in household types. While we do not observe household demographics in our data, we do observe a rich set of property/transaction characteristics that we use as proxies for any differences in subsequent purchase behavior due to household wealth or preferences for different housing types: we control for the sold property zip code median house price at the time that the household originally bought the home. We further include a set of fixed effects for the property characteristics of the sold property, constructed as the interaction of the square footage of the home (in percentiles), lot size (in deciles), number of bedrooms, number of bathrooms, and age of the home (in 5-year buckets). Finally, we include a fixed effect for the number of years lived in the sold home, which controls for potential differences in expected holding periods, e.g. the likelihood of the transaction being an owner-occupied flip.

Intuitively, our baseline specification compares the price premium paid by two households moving into the same neighborhood at the same point in time whose sold homes were similar when they originally bought them—and the identifying variation comes from the fact that one household happened to experience higher house price growth than the other household in the area of their sold home during their tenure. Our robustness checks and additional control variables further restrict this comparison set by, for instance, adjusting for the average tendency of movers from particular locations to pay higher price premia, or for the differential tendency to buy recently renovated homes (see additional details in the following sections).

Using the change in the zip code median house price as an instrument, we estimate the first

[6]The one possible exception is within-year strategic timing. However, our results are robust to including an additional calendar month fixed effect to absorb seasonal differences in house prices. We can also replicate our results with sold and purchased zip-quarter fixed effects, which effectively eliminates the potential for any meaningful differences in strategic timing. See Appendix Table A.1.

stage regression:

$$EquityGain_{i,t} = \beta\, \Delta \text{HPI}^S_{z,t} + \lambda\, \text{HPI}^S_{z,t-tenure} + \alpha^S_{z,y} + \alpha^P_{z,y} + \alpha^{tenure}_i + \alpha^S_h + \varepsilon_{i,t} \tag{5}$$

where $\text{HPI}^S_{z,t-tenure}$ is the zip-level median house price of the sold property in the year that the household originally bought the home, $\alpha^S_{z,y}$ is a sold property zip code by year fixed effect, $\alpha^P_{z,y}$ is a purchased property zip code by year fixed effect, α^{tenure}_i is a years lived in sold home fixed effect, and α^S_h is a fixed effect for the set of interacted house characteristics described above. Given this stringent set of fixed effects, the variation in our instrument is limited to differences in within-year timing of both the sale and the original purchase of the property.[7] Unsurprisingly, the change in zip code house prices over the years lived in the house strongly predicts the realized equity gain; the first stage F-statistic is 221 in our main specification.

We then use the predicted equity gain from Equation 5 to estimate the following second stage regression.

$$PricePremium_{i,t} = \beta\, \widehat{EquityGain}_{i,t} + \lambda\, \text{HPI}^S_{z,t-tenure} + \alpha^S_{z,y} + \alpha^P_{z,y} + \alpha^{tenure}_i + \alpha^S_h + \varepsilon_{i,t}. \tag{6}$$

We expect that $\hat{\beta}_{IV} > \hat{\beta}_{OLS}$, since our instrument is designed to eliminate the effects of housing market sophistication which likely bias our naïve estimate downward. To interpret $\hat{\beta}_{IV}$ as the causal effect of equity gains on the price premium, the instrument must satisfy the exclusion restriction that changes in the median house price in the sold property zip code over the holding period do not affect the amount paid in excess of the current quality and neighborhood trend adjusted value of the purchased property except through changes in the household's housing wealth, conditional on our fixed effects and controls.

The fixed effects used in Equation 6 severely limit potential violations of this exclusion restriction. Any remaining concern is limited to a shock that simultaneously affects the median

[7]However, we show robustness to an alternative instrument that also varies based on differences across census tract-level supply elasticities, see Appendix Table A.1.

house price in the sold property zip code and only the price of houses in a small neighborhood within the purchased property census tract. The shock cannot affect the average purchase price in the purchased property zip code or it will be absorbed by the purchased property zip-year fixed effect. Additionally, the shock has to differentially affect properties within the purchased census tract-month, since the price premium is orthogonal to average price changes in this dimension. One possibility, consistent with this type of shock, could be the opening of a new, highly regarded school that has boundaries that include all of the sold zip code, but only a very small corner of the neighboring zip code, wherein the household purchased their new property. It is unlikely that this type of narrow story explains the average effect of our results.[8] Moreover, if paying higher prices reflects persistent changes in very local amenities, we would expect the household to receive a higher price when selling the house in the future. However, we show below that a higher price premium predicts *lower* future returns from holding the property.

One additional concern is that the realized equity gain on a sold property influences the decision of where to move. For example, a household that experiences a substantial appreciation in local house prices might endogenously decide to sell and move to a lower priced area, either to significantly upgrade their house or to extract the equity gains. This selection would only matter if it affects the price premium paid relative to average prices in the purchase census tract-month. Moreover, we include both sold and purchased property zip-year fixed effects to account for any differences in house price dynamics across move locations. To more fully account for potentially endogenous location decisions, we replicate our results using a specification that adds a purchase county × sale county × year fixed effect. This specification is conditional on move location choices—we compare two buyers moving from the same county to the same county in the same year, eliminating any differences due to move location decisions. We find similar results using this alternative specification. In Section 6.2, we further account for endogenous move location decisions at the aggregate commuting-zone-level using pre-established migration routes as an instrument for the move decision.

[8] Our results are also robust to excluding moves of less than 3 miles (see Appendix Table A.1), which is where these types of stories are most prevalent.

4 The Effect of Equity Gains on Housing Transactions

While there is a substantial literature examining frictions that impact residential real estate transactions (Kurlat and Stroebel, 2015; Gargano, Giacoletti, and Jarnecic, 2020), lack of data has prevented researchers from exploring how households make housing investment decisions across moves. The novel transaction-level panel dataset that we construct in Section 2 provides the first large, nationally representative source of data that tracks households across housing transactions. Using this data, combined with the 2SLS strategy described in Section 3, we examine how the relaxation of household financial constraints through shocks to housing wealth affects housing decisions when homeowners change their primary residence.

4.1 Characterizing the broad effects of equity gain

Our analysis is predicated on the idea that exogenous housing equity gains alleviate household financial constraints. Because the households in our sample are all multiple time homeowners, they likely have higher income and wealth than the average non-homeowner and are thus less financially constrained. Despite this, the typical homeowner is still constrained in their home purchase decision by the amount of mortgage that they quality for. To the extent that equity gains relax these financial constraints, we expect them to make it easier for households to obtain more mortgage credit. To test this idea, we calculate the combined loan-to-value ratio (CLTV) of each property at the original date of purchase using county loan records and the transaction price (loan data is only available for about 75% of our sample). We then use the 2SLS specification described in the previous section to estimate the effect of equity gains on the loan amount and CLTV of the household's next home purchase. The results are reported in columns (1) and (2) of Table 2. We find that households increase their borrowing—$1 of equity gain leads to an additional $0.53 of mortgage loan—but simultaneously reduce their overall CLTV. This reduction in leverage is meaningful; a $100,000 equity gain leads to a 3.5 percentage point decline in CLTV, or about a 4% decline relative to the average CLTV. The fact that households get larger loans at lower leverage ratios is evidence that equity gains relax financial constraints. Consequently, we interpret our remaining results as the impact of alleviating financial constraints on household purchase decisions.

We next document the broad effects of equity gains on the household's subsequent home purchase decision. The results, reported in Table 2, show that households use equity gains to buy a bigger, more expensive house located in a more expensive neighborhood. For example, for every $1 of equity gain, households spend an additional $0.87 on their next house (column (3)) and move to a zip code where the median house price is $1.25 higher (column (5)). The estimates in column (4) indicate that a household with a $100,000 higher equity gain on their sold house buys a 6% larger subsequent house.

Finally, in columns (6) and (7) we use building permit data to examine how equity gains affect the decision to renovate a home shortly after purchasing it. This data, described in detail in the next section, comes from BuildZoom and covers the universe of remodeling permits obtained from county registries. We find that equity gains increase both the likelihood of pulling a renovation permit, as well as the estimated dollar value of the remodel, in the 12 months following the home purchase. This is further evidence that equity gains relax financial constraints as the household is able to both purchase a home and immediately remodel it.

4.2 Equity Gains Cause Buyers to Pay a Premium

While the effects documented in the previous section are important, it is unsurprising that constrained households use a housing wealth shock to buy larger, more expensive houses, to renovate, and to reduce their housing leverage. Perhaps more interesting is the relation between equity gains and price premia. We first explore this by using OLS to estimate the relation as specified in Equation 3. The result, presented in column (1) of Table 3, shows a negative effect of equity gains on price premium. This is consistent with housing market sophistication being prevalent in the data; intuitively, sophisticated households earn large equity gains when they sell a house, and get a good deal (i.e., pay a lower premium) when they purchase a house. To explore how plausible housing market sophistication is, we examine the persistence of housing returns over time. We first calculate the annualized net return a household earned on their sold property over their holding period. We then estimate the future returns that a household will earn on their next purchased property as a function of their realized returns on their current sold property.[9] We include the same set of fixed effects as in Equation 6, which absorbs average prices at both the sold and purchased property location. The results are reported in Appendix Table A.2. We find a positive and highly significant relation between the realized return on a sold property and the future realized return on the purchased property, consistent with persistent housing market sophistication.

The existence of housing market sophistication negatively biases the OLS estimate of the effect of alleviating financial constraints on future house price premia. To identify the causal relation, we therefore use the change in the zip-level median house price over the period that the household owned the home as an instrument for the household's equity gain as specified in Equations 5 and 6. After correcting for sophistication through our instrumental variable strategy, we find that the effect of equity gain on price premia is positive and significant. The instrumented effect of equity gain on price premia is \$0.06 per dollar of equity gain (Table 3, column (2)). For the average household in our sample, which has an equity gain of \$86,000, this implies a premium of about \$5,160. Because of the dollar on dollar specification, we can interpret the coefficient as a 6% marginal propensity to spend an additional dollar of exogenous housing equity on paying a price premium for the acquired house.[10]

Because our repeat sales model does not have time-varying property characteristics, it is possible that households pay a premium to purchase a recently renovated house. To address this issue, we add data on remodeling permits from BuildZoom. This database covers the universe of renovation permits gathered from county registries and includes the type of remodel as well as the total estimated cost of the job. We follow a similar procedure to Giacoletti (2021) to merge

[9]Both are winsorized at a 1% and 99% level.

[10]This share of housing wealth gains spent on a higher price premium is economically quite significant. It is comparable in magnitude to estimates of marginal propensities to consume out of housing wealth that range from 6–11% (Campbell and Cocco, 2007; Carroll, Otsuka, and Slacalek, 2011).

the BuildZoom data to properties in our data. To control for recently renovated properties, we count both the number of permits and the total job value of all renovation permits completed in the 6 months prior to the sale of the property.[11] As expected, recently renovated houses do sell for more (see Appendix Table A.3). However, after including these renovation controls in column (3) of Table 3, we find that the estimated effect of higher equity gains is little changed, strongly suggesting that our effect is not driven by a premium for recently renovated properties.[12] Despite this, we include renovation controls in our remaining specifications to ensure that our estimates reflect a price premium adjusted for neighborhood trends, fixed property characteristics, and recent changes in house quality.

Another potential concern with our instrument based on origin zip code house price changes is that zip codes that experience high housing price growth might simultaneously experience high income growth which could lead households that benefit from both to pay higher price premia. As a first pass, our results are unchanged after controlling for zip-level household income at the time of original purchase ((see column (4) of Appendix Table A.1). To more fully alleviate any concerns about time-varying zip-level economic shocks, we create a new instrument by multiplying the census tract-level housing supply elasticity from Baum-Snow and Han (2023) with the change in the national median house price over the household's tenure in the sold property. This elasticity-based instrument isolates variation in households' equity gains that stems from long-run supply-side constraints in local housing markets that are likely orthogonal to any short-run changes in local-level economic conditions. Using this instrument we find similar estimates of the effect of equity gains on price premia (Appendix Table A.1, column (5)).

Additionally, to deal with concerns that differences in local economic conditions at the time of the sale drive our result, in Table 3 column (4) we add an additional set of fixed effects for sale county by purchase county by year. In this specification, we identify the effect of equity gains

[11] Some permits are missing job values. For these permits, we assign a zero dollar value. In our regressions, we include a separate indicator for observations that have missing job values, as well as an interaction with this indicator and the job value variable.

[12] Consistent with this, we find that equity gains do not predict buying a recently renovated house, see Appendix Table A.4.

on price premia by comparing two households who sell a house in the same origin county and then move to the same destination county in the same year (while simultaneously controlling for the zip codes that the households sold and purchased in). These households face identical local economic conditions. Using this specification, we find a somewhat larger effect of $0.07 of price premium per dollar of equity gain.[13]

While the marginal propensity to pay a premium out of housing wealth is an important economic concept, it is also interesting to understand the extent to which this equity gain-induced behavior scales with the price of the purchased property. To investigate this, we define *Price Premium Percent* as the dollar price premium on the purchased property (i.e., Equation 2) divided by the total price paid for the property. Using the same 2SLS framework, we estimate the effect of equity gain on *Price Premium Percent* and report the results in Table 3 columns (5) and (6). We find that equity gains cause a statistically significant increase in the price premium as a percentage of the purchase price. The estimates in column (5) imply that a household with a $100,000 equity gain on their sold house pays a premium of 1.6% of the purchase price on their subsequent house purchase. For the average purchased home in our sample, this implies a premium of about $5,940.

4.3 Equity Gains Lead to Lower Future Returns

What are the financial consequences for a household of buying a home at a premium when financial constraints are relaxed due to higher equity gains? To the extent that we are measuring an actual premium, and not time-varying unobservable property characteristics, households that pay a price premium are likely to realize lower equity gains in the future when they sell the house. We test these predictions using the same 2SLS specification described above and report the results in Table 4. Note that we do not have an instrument to identify the effect of paying a higher premium—instead, we estimate the the causal effect of the sold property equity gain on the future equity gain of the newly purchased property, conditional on a future sale. We find that

[13] An interesting question is the extent to which this effect is symmetric around gains/losses. In unreported results, we find no significant effect of equity losses on price premium after conditioning on losses, although the direction of the coefficient does suggest that losses lead to modest underpayments.

$1 of equity gain realized on their old property leads the household to lose $0.37 of equity gain in the future when selling their new property. Because equity gains not only lead to paying a higher premium, but also affect the type of house purchased and potentially the length of the holding period, this estimate does not fully isolate the effect of paying a premium on future returns. Despite this, the negative effect of equity gains on future realized equity gains is inconsistent with price premia reflecting the purchase of unobservably nicer properties.

One explanation for the negative relationship between equity gains and future returns could be that low equity gain households buy a fixer upper (because they are more financially constrained) and then renovate it in the future, earning higher returns (and thus making the relationship between equity gains and future returns negative). In column (2) we account for this possibility by using our renovation permit data to control for the total number and value of all remodels done over the *future* holding period of the house. Doing so leaves our main coefficient unchanged; the negative relation between equity gains and future equity gains is not driven by different renovation behavior across households.

We provide additional suggestive evidence using an OLS specification to estimate the effect of paying a price premium on future realized equity gains. To the extent that the price premium is truly orthogonal to the fundamental value of the property, we expect a dollar of price premium to lead to a dollar of future losses when selling the house. Table 4 columns (3) and (4) show that the estimated effect is close to a dollar for dollar loss; $1 of price premium paid is associated with a future loss of $1.09. Note that the strong statistical significance here is not surprising; if the price premium is actually orthogonal to the value of the house, this is a mechanical relationship. While not causally identified, this evidence further suggests that the price premium effect is not related to time-varying unobservable property quality.[14]

[14]Because sophisticated households likely pay a lower premium and earn a larger future equity gain, these OLS estimates are likely to be biased toward a more negative coefficient.

4.4 Robustness

In the Internet Appendix, we show that the effect of equity gains on price premia is robust to a wide variety of alternative specifications. In particular, the results are little changed when adding purchase and sale zip by quarter fixed effects, purchase and sale census tract by month fixed effects, excluding moves of less than 3 miles, and controlling for the zip-level household income (or change in zip household income) of the purchase county (see Appendix Table A.1). The effects of equity gains persist across all years in our sample, though they are stronger in the early years of our data (1996-1999) and marginally weaker in the most recent years. Moreover, the estimated effect of equity gains on price premia is not driven by any one particular time period or housing cycle (see Appendix Table A.5).

A well-documented fact in the literature is that buyers who pay in cash receive a discounted price (Reher and Valkanov, 2021). In Appendix Table A.6, we confirm that households that pay in cash pay a lower premium (i.e., they receive a cash discount). However, even after controlling for cash purchases we continue to find that households use large equity gains to pay a premium for their next house.

5 Why do Equity Gains Cause Buyers to Pay a Premium?

It is puzzling that households spend some of their realized wealth to pay a premium over a property quality and neighborhood trend adjusted value for their next home, particularly given the potential inability to recoup these financial costs when reselling the property that we documented above. In this section, we explore potential mechanisms that might explain this behavior.

5.1 Price premia are not driven by beliefs

One set of possible explanations for why households use equity gains to pay a premium is broadly described by beliefs about prices. For example, a household might benchmark the price they offer for their next house relative to the price they received for their current house. A household that offers a price based on benchmarking is especially likely to pay a premium when moving to a lower price area Simonsohn and Loewenstein (2006). We explore the extent to which this can explain our results by including an indicator variable for moving to a lower price zip and interacting this indicator with equity gain.[15] The results, reported in column (1) of Table 5, suggest that benchmarking exists—households that move to lower priced areas pay a higher premium on average. However, the relation between equity gains and the price premium is not primarily explained by benchmarking. When allowing the effect to differ by whether the household is moving to a cheaper area, the total effect of equity gains on the price premium remains similar at about \$0.06 per dollar of equity gains when moving to a higher priced area, and \$0.05 when moving to a lower-priced one.

A second possible belief channel could arise if equity gains influence a household's expectations about future housing returns. A household that experiences large equity gains might update their belief that future house prices will also rise significantly and thus be less worried about paying more. To explore this, we use heterogeneity in equity returns driven by differences in leverage. For two households with the same dollar equity gain, the household with a higher original CLTV experiences a much larger return on equity. Consequently, if households are affected by their experienced returns, we expect equity gains to matter more for high CLTV households.

We re-estimate our baseline specification including an indicator variable that is equal to one for households that had an original CLTV greater than 80%. We also interact this indicator with equity gains. The inclusion of these CLTV indicators does not significantly alter the coefficient on equity gain, suggesting that the salience of returns is not driving our results (see Table 5, column (2)). While we cannot fully rule out the possibility that beliefs play a role in the relation between equity gains and price premia, the evidence in Table 5 suggests that frictions related to benchmarking or beliefs are not the primary explanation for our results.

[15] Many of our specifications have two potentially endogenous variables: equity gain and equity gain×characteristic. We use our original instrument (change in zip-level house prices) interacted with the characteristic as a second instrument for these specifications.

5.2 Relaxed financial constraints leads to less information gathering

Buyers in residential real estate markets face substantial information asymmetry (Kurlat and Stroebel, 2015). Overcoming these information frictions is costly—buyers have to expend substantial time and effort to become informed about the quality and neighborhood-trend adjusted value of a particular house. Less constrained households might rationally choose to remain ignorant and pay a premium rather than exerting the effort necessary to discover the value of the house. Alternatively, because equity gains relieve financial constraints, buyers can now consider a larger set of houses. This increases the probability that the buyer finds a match for which they have a relatively high private valuation, and consequently is more willing to pay a premium. Gargano, Giacoletti, and Jarnecic (2020) provide evidence that is consistent with both of these channels. They show that local area price appreciation causes capital-constrained potential movers to search across a broader set (both in terms of geography and in terms of house characteristics) of properties. This broader search could lead to a better, higher private valuation match. However, Gargano, Giacoletti, and Jarnecic (2020) also show that this increase in local price appreciation does not change the amount of time potential movers devote to any particular listing and furthermore shortens the ultimate duration of the search. Searching across a broader set of properties in a shorter period could thus also be consistent with putting less effort into acquiring information about specific properties.

We distinguish between these two channels by investigating how the sensitivity of the price premium to equity gains varies based on the characteristics of the local market as well as those of the moving household and report the results in Table 6. We first examine the interaction of equity gains with the number of years that the household lived in their sold property after restricting the sample to within-county moves. For this set of local moves, a household that has lived in their sold home for a longer time is likely to be more familiar with the local area, and thus face less information asymmetry when moving. Consequently, the information channel predicts that the sensitivity of price premia to equity gains will be lower for these long-tenured local movers. At the same time, households that have lived in the area longer and that are also moving within that same area are likely to have more strongly developed housing preferences. Moreover, these long-tenured households have implicitly had a longer period to search the local housing market (even if only passively), and so they are more likely to have found houses that are particularly well-matched for their preferences. As a result, the private valuation channel predicts that the sensitivity to equity gains will be higher for local, long-tenured movers.

We estimate the effect on price premia of the interaction of equity gains both with a continuous measure of the years lived in the sold property in column (1), as well as an indicator variable for households that have lived in their home for more years than the sample median in column (2). Across both definitions we find that the sensitivity of the price premium to equity gain is lower for long-tenured local movers. A household that has lived in their house more than the median number of years has a sensitivity of the price premium to equity gain that is nearly 30% smaller than a household that has lived in their home less than the median number of years. This is consistent with the information channel and inconsistent with the private valuation channel.

While tenure in home has the advantage of offering clear and opposite predictions for the information gathering vs. private valuation channels, it comes at the cost of only being relevant for the subsample of local moves. To provide evidence across our full sample of moves, we use two additional proxies for the local information environment: historical transaction volume and house price volatility. We expect it to be easier to gather information about recent comparable transactions when recent transaction volume is high; as a result, the information channel predicts that the effect of relaxing financial constraints on price premia paid will be lower. In column (3), we define historical transaction volume as the number of transactions that occurred within a half-mile radius of the purchased property over the prior 90 days and find that price premia are less sensitive to equity gains when transaction volume is high. Moving from the 25^{th} to the 75^{th} percentile of historical transaction volume decreases the effect of equity gain on price premia by about 8%.

In columns (4) and (5) we define price volatility as either the standard deviation of price premia or the standard deviation of transaction prices for all transactions that occur within 90 days before the purchase and within a 1/2 mile radius of the purchase property.[16] Higher price dispersion in the recent local market reduces the precision of comps and increases the difficulty of determining the correct price for a property. Consequently, the information channel predicts that the sensitivity of price premia to equity gains will be higher for areas with higher price dispersion. Across both measures of price dispersion we find that the sensitivity of price premia to equity gains is higher in more uncertain environments.

Importantly, the transaction volume and price dispersion results do not have unambiguous predictions under the private valuation channel. Consequently, while these findings are consistent with the presence of the information channel, they do not rule out that some of the price premium effect might come from higher private valuations. However, the combined evidence in Table 6 strongly suggests that relaxed financial constraints lead households to substitute the effort costs of acquiring information about a house with simply paying a premium.

6 The Spillover Effects of Relaxed Financial Constraints

Do the property-level effects that we document in the previous section have implications for broader housing markets? In this section, we investigate the impact that a household with large equity gains has on neighborhood house prices when they move in, and also consider broader city-level housing market impacts. Because residential housing markets are relatively illiquid and because prices are often based, in part, on previous transactions used as comparables, it is possible that households with large equity gains that pay a premium for their house cause prices to go up in the surrounding neighborhood. We first investigate this possibility using our household-level data to examine local neighborhood spillovers, and we then aggregate our data to the commuting zone to study how the inflow of movers with higher housing equity gains affects aggregate house price growth.

[16] We divide the standard deviation by 100 to make the coefficient easier to read.

6.1 Equity Gains Spill Over to Local Neighborhood

We define the neighborhood price following a property purchase as

$$\text{NeighborhoodPrice}_{i,N,t,T} = \frac{\sum_{s=0}^{T} \sum_{j \neq i \in N} P_{j,t+s}}{\sum_{s=0}^{T} \sum_{j \neq i \in N} 1} \tag{7}$$

where household i purchases a house in neighborhood N at time t. The neighborhood price is the average price of all homes j located in neighborhood N that sell within T days of the purchase. We examine spillovers for two time windows T (180 and 360 days) and four different definitions of neighborhood N (houses within 0.5, 1, 1.5, and 2 miles of the purchased house).

We estimate the spillover effect that a household's equity gain from their sold house has on prices in the neighborhood surrounding their purchased house using the same two-stage least squares framework that we use to study price premia. The results are reported in Table 7. Focusing on column (1), we find that a household moving in with a larger equity gain causes a larger increase in neighborhood prices. An extra \$1 of equity gain causes the average price of homes sold in the half mile radius around the purchased property to go up by \$0.085 in the 180 days after the purchase. Looking across the columns of Table 7, we find that the impact of equity gain on neighborhood prices diminishes both with time and over distance. By one year after the purchase, the effect of equity gain on house prices within a half-mile is still significant, but 20% smaller. In contrast, for houses within 2 miles, the effect has fallen by 60% and is no longer statistically significant. This pattern is strongly consistent with price spillovers operating through a local comparables channel, either directly (through appraisals) or indirectly (through affecting sellers' reservation prices).[17]

Our identification strategy is designed to estimate the causal effect of equity gain on price

[17] In line with the declining spillover effects when going beyond a 1-mile distance that we find here, Freddie Mac's "Single Family Seller Servicer Guide" notes that an appraiser would most likely use comparables "in the immediate vicinity" of the property if it is in a suburban or urban area. (URL: https://guide.freddiemac.com/app/guide/home). Similarly, the "HUD Instructions for Completing the Uniform Residential Appraisal Report" declared in 1994 that a separate explanation was needed, "if comparable is more than 1 mile from subject" (URL: https://www.hud.gov/sites/documents/DOC_36119.TXT). Additionally, this measure is similar to those utilized in the foreclosure externality literature. See, e.g., Fisher, Lambie-Hanson, and Willen (2015) and Gupta (2019).

premia net of neighborhood level price trends. Thus, while we believe that the most likely channel through which equity gains lead to price spillovers is through high equity households paying a premium, we cannot test that directly. However, in Appendix Table A.7 we provide additional evidence that suggests that the spillover effect operates through the price premium channel by showing that the spillover effect of equity gain on neighborhood prices varies with the information environment in strikingly similar ways as the effect of equity gain on the price premium. Specifically, we find that the effect of equity gain on price spillovers is smaller in areas with high historical transaction volume and for households moving locally that have lived in the area for longer periods of time, and larger for areas with increased historical price dispersion.

While not dispositive, the collective evidence in Table A.7, combined with the fact that the magnitude of the effect of equity gain on price spillovers is very similar to the magnitude of the effect of equity gain on price premia, strongly suggests that an equity gain-induced price premium pushes up prices in the neighborhood surrounding the purchased property. However, to better identify this effect, we introduce a different specification in the next section.

6.2 Aggregate Impact of Housing Equity Gains

An important policy concern related to housing capital flows is what share of overall house price growth in a local market can be attributed to the inflow of housing capital gains. While other research has shown that migration effects housing markets (see, e.g. Howard (2020)), we contribute new evidence on whether the financial resources of movers matter for their impact on the destinations. There are several reasons why the spillover effects estimated above cannot easily be translated into an estimate of the aggregate effect: (1) Our property-level estimates condition on characteristics of the buyers' areas of origin, which at least partially eliminates the effects coming from an area's exposure to particular *geographies* (rather than households within geographies) that have higher equity gains. (2) The spillover effects on other properties may lead to knock-on effects on further properties and may interact with the spillovers from other purchases in the area—as a result, the aggregate effect may differ from the partial equilibrium effects. (3) If high housing equity purchases cluster in the same year and county, then the effect on individual properties and their neighborhood may cumulate as premia for the first purchases enter the comparables for the later ones. [18]

6.2.1 Aggregate effect specification

We analyze the overall effect of equity gains moving into a neighborhood by considering the impact on house price growth at the commuting zone (CZ) level.[19] We focus on identifying the effect of buyers moving into a commuting zone from the outside, as it is easier to construct plausibly exogenous variation with regard to destination CZ trends in such long-distance moves.[20]

We estimate CZ-year-level regressions of the form:

$$\Delta \ln P_{c,t} = \alpha_c + \alpha_t + \beta \ln eg_{c,t}^{\text{non-local}} + \epsilon_{c,t}, \tag{8}$$

where we include CZ c and year t fixed effects (α_c and α_t) in order to capture general differences in the growth rate of house prices across housing markets, as well as macroeconomic trends (e.g. interest rate changes) that affect all locations equally. The dependent variable is the CZ's growth rate (log change) in the Federal Housing Finance Authority's repeat-sales house price index.[21] The equity gain variable $eg_{c,t}^{\text{non-local}}$ represents the expected total equity gains brought by in-migrants, scaled to be in units of dollars per local household in the destination CZ.

This total inflow of equity gains cannot be directly measured in our property-level data as we do not necessarily have full coverage of all transactions in a CZ. Instead, we combine our data on average equity gains among buyers with data on total movers between counties from the Internal

[18] The causal estimates of individual household mover equity gains on property-level price premia reported in Section 4.2 are not biased by the effects discussed here, however, because neighborhood-level trend controls are included in the construction of our premium measure.

[19] We use commuting zone as a proxy for contiguous housing markets.

[20] The moving decision of households that come from the same CZ in which we are measuring our outcome variable is more likely to be endogenous with regard to local house price trends.

[21] This is constructed from county-level HPI data from the FHFA, which we convert into annual log changes at the county level, and then aggregate to CZ level average log changes, weighting each county by its population in the year 2000. For CZs with $<$ 10% of its population in counties with FHFA data in that year, missing counties' data is replaced by state-level log changes in the HPI before aggregating.

Revenue Service's Statistics of Income (SOI) database.[22] First, we use the ZTRAX data to estimate the average equity gain among observed out-of-CZ buyers in destination c. Second, we scale this average equity gain $\overline{\text{EquityGain}}^{\text{non-local}}$ into an estimate of total equity gains from all non-local movers per local household by calculating

$$eg_{ct}^{\text{non-local}} = \overline{\text{EquityGain}}_{ct}^{\text{non-local}} \times \frac{\text{OutOfCZMovers}_{ct}^{\text{IRS}}}{\text{ResidentHHs}_{c,2006}^{\text{IRS}}}, \tag{9}$$

where $\text{OutOfCZMovers}_{ct}^{\text{IRS}}$ is an estimate from IRS migration data of total household inflows into the commuting zone c from origin CZs at least 50 miles away and $\text{ResidentHHs}_{c,2006}^{\text{IRS}}$ is the total number of local households residing in the CZ in 2006.[23]

Movers between CZs may be selected in a way that would introduce bias into a simple OLS estimation of the effect of these equity gains on local house price growth. For example, movers that sell their house in response to high house price growth in their origin city may be more likely to move to other cities experiencing high house price growth (for instance, because there is a common cause for these house price changes, such as a revaluation of shared natural amenities). At the same time, high house price growth destinations may attract additional equity gain inflows from speculators *because* their prices are rising. To mitigate these concerns around the endogenous destination choice of movers, we construct an instrument that captures plausibly exogenous equity gain flows between CZs.

To construct a plausibly exogenous flow of *predicted movers* for each origin-destination CZ pair, we use historical migration links as predictors of contemporaneous migration flows (Howard, 2020; Schubert, 2021). That is, the predicted number of movers from k to c is constructed from IRS migration data as a "shift-share" instrument that captures the degree to which the characteristics of CZ k are prompting outflows in period t, and the average share of those outflows that would be expected to go towards CZ c—for instance, because of low migration costs or historic

[22]See Appendix section A.2 for full details on the construction of equity gain flows and the instrument

[23]2006 is the first year of our panel for the aggregate effects estimation.

family connections between these locations[24]—but without using any period t variation from CZ c itself that might potentially be correlated with local house price trends in c. Moreover, when aggregating these predicted flows from other CZs, we omit migration flows from CZs that are less than 50 miles away, in order to eliminate bias from the migration dynamics of CZs that may have overlapping local housing and labor markets with the destination CZ of interest.

Similarly, the predicted average equity gain among people moving into CZ c is constructed without using data on the equity gain characteristics of actual contemporaneous flows from k to c, which might be selected based on destination characteristics. Instead, we assume that movers from high equity gain locations are also generally more likely to have higher equity gains. Thus, destination CZ c is expected to have higher average equity gains among its incoming households if it has higher historic migration exposure to CZs that are experiencing high equity gains among their house sellers in period t, so we construct a weighted average $\overline{EquityGain}_{ct}^{\text{origins}}$ of those origin city characteristics with weights based on historical migration flows.

We combine these measures to construct our instrument for equity gains (per local household) flowing into CZ c from other CZs:

$$\widetilde{eg}_{ct}^{\text{non-local}} = \underbrace{\left(\sum_{k:\, dist(\text{CZ(k)},\text{CZ(c)})>50\text{mi.}} \widehat{Mig}^{k \to c} \right)}_{\text{Predicted Out-of-area Inmigration}} \times \overline{EquityGain}_{ct}^{\text{origins}} \times \frac{1}{\text{ResidentHHs}_{c,2006}^{\text{IRS}}} \qquad (10)$$

This shift-share approach results in an instrument for the total equity gain inflow into CZ c in year t that does not use any contemporaneous information on the actual number or characteristics of movers with equity gains coming into c and thereby eliminates any correlation between the contemporaneous destination choices of movers and local house price dynamics in c. Instead, the instrument relies on variation across CZs in their historical exposure to migration from particular distant CZs, in conjunction with variation over time in the average equity gains in those distant CZs.

[24]See Schubert (2021) for an analysis of the determinants of migration flows in recent decades, which include similar industry composition and demographics, physical proximity, and cultural similarity.

6.2.2 Aggregate effect estimates

We use this instrument in a two-stage least squares setup to obtain an estimate of the causal effect β of out-of-area housing equity gain inflows on local house price growth in equation 8. We also include CZ fixed effects in the estimation to account for the fact that some areas may have higher house price growth trends on average, as well as year fixed effects to control for common macroeconomic trends in house prices.

The results are shown in Table 8. Column (1) shows the first stage, corresponding to a regression of the log of $eg_{ct}^{\text{non-local}}$ on the log of $\widetilde{eg}_{ct}^{\text{non-local}}$. The instrument has a significant and positive effect on the predicted actual equity gains flowing into the CZ. In column (2), we first use OLS to estimate the specification shown in equation 8. The raw relationship between housing equity gain inflows and local house price growth is positive but relatively small, with a coefficient of about 0.7. In column (3), we use our instrument to estimate the causal effect of out-of-area housing equity gains flowing into CZ c on its house price growth. We find that out-of-area equity flows have a positive and significant causal effect on the destination CZ's house price growth, with an estimated coefficient on local house price growth with regard to equity inflows per local household of about 4. This implies that a 10% increase in the average housing equity gain per local household brought into a CZ by out-of-area movers causes about a 0.4 percentage point increase in local house price growth. The higher IV coefficient suggests that the OLS estimate is downward-biased. That is, migrants that have experienced high housing equity gains seem to choose on average to move to markets that are experiencing lower house price growth in that period, in line with movers responding endogenously to differences in housing market opportunities across cities.

We implement a number of robustness checks to address potential concerns about the identification of the aggregate equity gains effects: On the one hand, Schubert (2021) and others have shown that migration into an area can increase house price growth, even without considering the financial constraints of migrants. We control for overall migration pressures into the area by including the log of the predicted out-of-area inmigration into c (as defined in equation 10) as a control variable in the regression, with results shown in column (4). In column (5), we control for whether the destination CZ is a "hot" market with high housing market turnover, by including the log of the total number of sales transactions in our ZTRAX data per local resident household in the regression. In column (6), we explore whether shocks to local labor demand—perhaps interacting with local supply constraints (Saiz, 2010)—might be jointly driving local house price growth and equity gains inflows. We control for this possibility by directly including shift-share shocks based on local industry exposure to national wage trends in the regression, as suggested by Chodorow-Reich and Wieland (2020), and also interacting them with the share of local land unavailable for construction as a proxy for housing supply constraints (Lutz and Sand, 2022).[25] Our IV estimates of the causal effect of equity gain inflows on local house price growth are significant and little changed in magnitude across these different specifications.

Moreover, the literature on the house price effects of migration generally suggests that the size of the effect of a change in local housing demand—here due to higher equity gains among migrants—should depend on local housing supply constraints (Saiz, 2010). In column (7), we show that this is also the case here: interacting the equity gain inflows (and the instruments) with quintiles of CZ-level land constraints, we find that the house price effect monotonically increases with land constraints and is not significant for the two least-constrained quintiles of commuting zones.

Note that, while the log-change-to-log specification here is not directly comparable to the property-level results in the previous section, the aggregate effect estimates are generally larger than our estimates of property-level impacts of housing equity gains on house prices. There are two possible reasons for this. First, our price premia results deliberately control for zip code level price trends in order to avoid conflating a property's higher price with increasing prices in an area in general. This means that if multiple high equity gain movers were to move into the same

[25]The reason why we use labor demand shocks rather than local wages themselves is that local wages are endogenous with regard to local housing market dynamics, so actual local wage growth would be a "bad control" in this setting as it may capture—and thus eliminate—the variation of interest in the dependent variable. See Schubert (2021) for the construction of the included labor demand "Bartik" shocks based on multiplying a vector of local CZ industry composition in 1990 by industry-specific leave-one-out national wage growth.

neighborhood at the same time then the premium estimates we recover are net of the *common effect* of high equity gain movers on the zip code house prices. In contrast, the aggregate effect analysis shown here includes the common effects caused by multiple moves into the same area, which is the relevant effect for quantifying the importance of these flows for housing market dynamics. Second, the spillover effects found above could cumulate over time within a year. If one high equity gain purchase increases a neighborhood's prices, it may then feed into the comparables for later purchases, which, in turn, may be affected by price premia from other high equity gain movers. The resulting aggregate effect of multiple movers into a housing market can be higher than individual property effects because of this multiplicative dynamic.

We can also use this aggregate setting to explore additional evidence on the mechanism driving the price premia effects found in the property-level data. In the Internet Appendix, we use a cross-sectional analysis to examine the effect of equity gain inflows on the time-on-market of properties at the destination. We find that out-of-area housing equity gains not only drive up local prices, but also reduce time-on-market (see Table A.8). This suggests that households may use equity gains to pay for speed, which is consistent with our micro-level evidence suggesting that households trade off information gathering with paying premia.

In general, the large positive effects from inflows of out-of-area housing equity gains on local housing markets provide causal evidence of a mechanism oftentimes postulated in anecdotal reports of why house prices lift off in smaller markets experiencing inflows. We find that the housing equity gains of the migrants indeed play an important role by amplifying the impact on the destination housing markets.

6.3 Local vs. Non-local Movers

A remaining interesting question is the extent to which the sensitivity of price premia and spillovers to equity gain varies by the distance of the move. A popularly held opinion in the press is that wealthy, out-of-town home buyers are driving prices up for everyone.[26] By construction, our aggregate analysis is only able to identify the effect of non-local equity inflows. Consequently, to shed light on the extent to which local vs. non-local buyers drive up house prices we return to our household-level analysis.

We begin by splitting moves into four categories based on the sale and purchase locations: within zip; out-of-zip, but within county; out-of-county, but within state; and out-of-state. We include indicators for each of these move types, as well as the interaction of these indicators with equity gain, in our 2SLS estimates of the effects of equity gain on price premia and price spillovers. Note that our baseline category is within-zip moves, so the estimated coefficients represent the marginal difference in the sensitivity of price premia and spillovers to equity gains relative to households that move within the same zip code.

The results are reported in Table 9. In columns (1) and (2), we show how the sensitivity of the price premium to equity gain varies across move distances. Unsurprisingly, and consistent with price premia being a function of information asymmetry, the average price premium is monotonically increasing with distance. However, the sensitivity of the price premium to equity gains follows the exact opposite pattern. Non-local movers use less of their equity gain to pay premia—out-of-state movers have a sensitivity of price premia to equity gain that is half the magnitude of within-zip movers.[27] In Column (2), we show that this result is not driven by our particular choice of discrete distance categories—the effect of equity gain on price premia continuously decreases with the distance of the move. Not only does local equity gain result in a larger price premium than non-local equity gain, but it also results in higher spillovers as shown in Columns (3) and (4).

The popular press narrative regarding wealthy out-of-towners outbidding locals thus requires

[26]For example, consider this recent headline from Bloomberg, "Out-of-Town Home Buyers Will Pay 30% More Than Locals in Hottest U.S. Markets." See https://www.bloomberg.com/news/articles/2022-02-15/top-10-most-competitive-housing-markets-where-out-of-towners-outspend-locals

[27]For the average equity gain in our sample, the total effect of equity gain on the price premium varies very little across move distance. Interestingly, if spillovers are driven by price premia, this would suggest that the average effect of equity gain on spillovers will not vary by distance. This is consistent with the level effects of the distance indicators being small and insignificant in Table 9 Column (3).

some qualification: while out-of-towners pay larger price premia on average, this is less a function of their housing wealth than for locals.[28] An intuitive explanation for how these results align with the information channel discussed above would be that the effectiveness of information gathering may decline with distance. As a result, long-distance buyers might pay larger premia on average (because they are less informed to begin with), but financial constraints may matter less for the price premium that they pay because the ability to gather information instead of paying a higher price premium is limited for long-distance movers.

7 Conclusion

House price appreciation over the last several decades has generated substantial wealth for homeowners. Using a novel dataset that allows us to track homeowners across moves, we document a surprising fact: households that experience relaxed financial constraints as a result of these equity gains use this flexibility to pay a significant price premium for their next house, relative to a quality and neighborhood trend adjusted value for the property. This behavior has real consequences for household finances as paying a price premium leads to significantly lower future returns when selling the property. Given this, why do households use their housing wealth in this manner?

We provide evidence that the relation between equity gains and price premia is likely driven by a mechanism related to information frictions in the residential real estate market. Because housing markets are segmented and illiquid, acquiring information about the value of a house takes a significant amount of time and effort. Constrained households expend this time and effort to figure out the best price for a house. In contrast, relieving their financial constraints causes households to substitute paying more for the effort of costly information acquisition; they choose to pay a premium and remain ignorant about the best price rather than pay the effort costs necessary to become informed. This individual behavior creates externalities—households with large equity gains that move into an area drive up home prices for the entire housing market.

[28]This is true for the vast majority of counties in our data, see Internet Appendix Section A.3.

We find that the common story that rich out-of-towners drive up prices is incomplete—local movers with lots of housing wealth drive up neighborhood prices by more than similarly wealthy non-local movers, albeit relative to a baseline of higher premiums by non-locals regardless of their wealth. At the aggregate-level, though, the effects of housing wealth flowing into an area do put a significant amount of price pressure on local house prices. Together, our results show that financial constraints play an important role both in explaining household-level housing decisions and in explaining aggregate-level housing dynamics.

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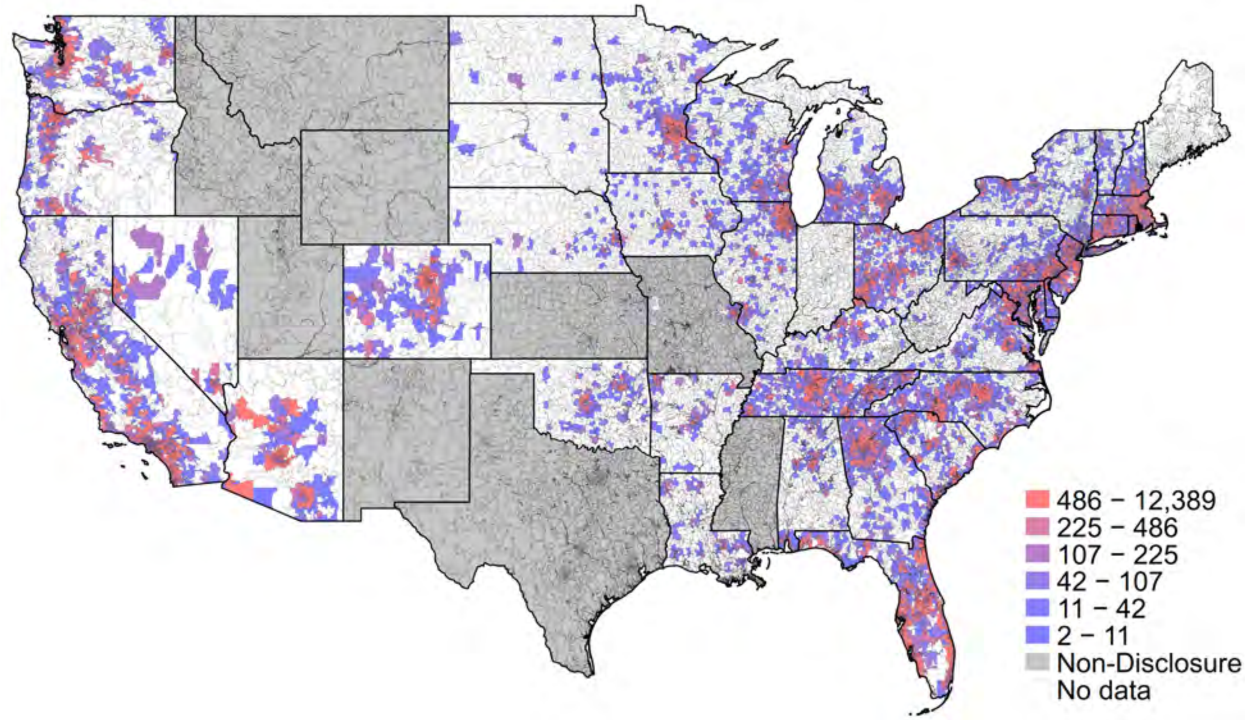

Figure 1. Zip-Level Observation Count This figure presents a zip-level representation of the location of the purchased property for the 2.9 million household moves in our main regression sample. States (and counties in the case of Missouri) with non-disclosure of transaction price policies are shaded gray.

Table 1
Summary Statistics

This table reports summary statistics related to the sample of ZTRAX transactions included in the repeat sales residual model (Panel A) and the full sample of matched household moves (Panels B through E). Panel A describes the universe of ZTRAX transactions that are included in our repeat sales residual model sample, irrespective of move match status. Panel B reports the characteristics associated with the sold property and the sale transaction. Panel C reports the characteristics of the move itself. Panel D reports the characteristics associated with the purchased property. Panel E reports results related to the neighborhood (at various levels) surrounding the purchased property.

Variable	Obs.	Mean	Std. Dev.	Q5	Q25	Q50	Q75	Q95
Panel A: Repeat Sales Residual Sample								
Transaction Price	72,138,407	246,406	221,886	50,000	111,000	180,500	305,000	653,500
Price Premium	72,138,407	0.0000	63,619	-84,503	-19,838	185.95	20,183	82,629
Price Premium Percent	72,138,407	-6.0%	49.1%	-65.0%	-11.3%	0.1%	10.1%	35.5%
Square Footage	64,330,935	1,899.81	1,082.89	858	1,225	1,618	2,243	3,793
House Age	65,627,192	29.75	26.41	0	8	23	46	85
Number of Bedrooms	52,390,026	3.14	0.99	2	3	3	4	5
Number of Bathrooms	47,121,851	2.35	0.96	1	2	2	3	4
Panel B: Sold Property								
Equity Gain	2,911,155	86,177	142,225	-35,000	16,000	50,000	116,000	331,500
Years Lived in Home	2,911,155	6.57	5.28	0.90	2.83	5.12	9.09	16.94
Realized Return	2,852,933	45.3%	69.0%	-10.3%	8.6%	25.5%	56.9%	160.6%
Zip ΔHPI over Holding Period	2,911,155	65,343	99,878	-43,250	10,000	43,750	98,590	245,000
Zip Median HP at Purchase	2,911,155	214,450	131,800	83,750	130,000	176,250	257,000	470,000
CLTV at Purchase	810,262	84.1%	15.4%	51.6%	79.8%	85.0%	96.5%	101.4%
Square Footage	2,681,396	2,030.04	1,065.65	934	1,334	1,781	2,430	3,870
House Age	2,777,862	29.12	24.63	3	10	21	43	80
Number of Bedrooms	2,198,051	3.22	0.89	2	3	3	4	5
Number of Bathrooms	1,983,668	2.51	0.93	1	2	2	3	4
Panel C: The Move								
Transaction Date	2,911,155	04/26/2011	6 Yrs 11 Mos	01/31/2000	01/19/2005	08/24/2012	08/03/2017	09/04/2020
Move Distance (Miles)	2,849,130	331.38	616.54	0.52	3.30	12.17	375.67	1,964.38
In-Zip Move	2,911,155	18.4%						
Out-of-Zip, In-County Move	2,911,155	30.4%						
Out-of-County, In-State Move	2,911,155	19.4%						
Out-of-State Move	2,911,155	31.7%						
Panel D: Purchased Property								
Transaction Price	2,911,155	371,254	265,508	95,000	199,000	301,984	458,900	877,500
Price Premium	2,911,155	9,360	68,938	-76,991	-17,368	3,749	29,475	115,660
Price Premium Percent	2,911,155	-1.5%	33.0%	-30.6%	-6.3%	1.3%	9.1%	28.0%
Future Equity Gain	1,427,759	66,093	154,575	-114,000	4,500	41,500	105,300	320,000
Future Years Lived in Home	1,427,759	5.82	4.50	0.66	2.34	4.51	8.35	14.95
Future Realized Return	1,399,232	29.1%	57.7%	-29.2%	2.0%	16.6%	40.8%	115.6%
CLTV at Purchase	2,220,156	80.8%	16.0%	47.5%	75.0%	80.0%	95.0%	100.0%
Cash Only	2,911,155	17.9%						
Square Footage	2,694,588	2,323.47	1,153.90	1,034	1,548	2,096	2,804	4,319
House Age	2,720,431	24.52	23.69	0	6	17	36	74
Number of Bedrooms	2,194,941	3.41	0.94	2	3	3	4	5
Number of Bathrooms	1,966,346	2.77	0.98	1	2	3	3	4
Panel E: Purchase Neighborhood								
Zip Median House Price	2,909,616	278,651	166,809	105,500	166,000	236,750	340,000	605,000
Average Sales Price, 1/2-Mile, 0-180 Days	2,832,624	330,535	202,829	114,639	192,940	278,019	407,893	733,413
Historical Average Sales Price, 1/2-Mile, 0-180 Days	2,835,524	320,615	197,522	111,091	186,697	269,518	395,553	712,562
Historical Transaction Volume, 1/2-Mile, 0-90 Days	2,878,828	18.79	23.29	1	6	13	24	53

Table 2

The Effects of Equity Gains on Future Housing Consumption

This table reports 2SLS estimates of the effect of equity gain on a sold property on the characteristics of the household's subsequent purchased property. The specification is similar to that of Equation 6. The dependent variables include: the dollar value of the combined mortgages associated with the purchase, the combined loan-to-value ratio (CLTV), the transaction price, the log square footage of the purchased property, the median house price of the zip code where the purchased property is located, an indicator for whether the moving household applied for a building permit on the purchased property within 360-days after the purchase and the total job value of all permit applications within 360-days after the purchase, respectively. Results relate to the full sample of matched household moves, with columns (1) and (2) further restricted to observations with mortgages linked to the property. All dollar amounts are in $100,000 units. Controls and fixed effects are included as indicated. The Kleibergen-Paap rk Wald F statistic is reported for all 2SLS specifications. Reported t-statistics in parentheses are heteroskedasticity-robust and clustered at both the purchase county and transaction year levels. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Loan Amount, House Being Purchased	CLTV, House Being Purchased	Transaction Price, House Being Purchased	Log House Size (Sq. Ft.), House Being Purchased	Zip Median HP, House Being Purchased	Permit Application One Year After Purchase	Job Value of Permit Application One Year After Purchase
	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Equity Gain, House Being Sold	0.528***	-0.0350***	0.872***	0.0601***	1.245***	0.00271*	0.00624***
	(24.69)	(-7.95)	(21.76)	(7.78)	(20.07)	(1.87)	(7.34)
Zip Median HP of Sold Home at Purchase	X	X	X	X	X	X	X
Five Interacted Property Sold Characteristic FE	X	X	X	X	X	X	X
Years Lived in Sold Home FE	X	X	X	X	X	X	X
Sale Zip × Transaction Year FE	X	X	X	X	X	X	X
Purchase Zip × Transaction Year FE	X	X	X	X	X	X	X
Instrumental Variable	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period
Observations	2,183,076	2,183,076	2,911,155	2,686,067	2,909,131	2,911,155	2,911,155
Weak ID KP *F* Stat	204.2	204.2	226.5	215.0	224.9	226.5	226.5

Table 3

Equity Gains Cause Buyers to Pay a Premium for Their Next House

Column (1) estimates Equation 3 reporting the correlation between $PricePremium_{i,t}$ (as calculated in Equation 2) and $EquityGain_{i,t}$ (as calculated in Equation 1). Columns (2) through (4) estimate Equation 6 and report the causal effect of $EquityGain_{i,t}$, instrumented with $\Delta \text{HPI}^{S}_{z,t}$ (as calculated in Equation 4), on $PricePremium_{i,t}$. Columns (5) and (6) replicate columns (3) and (4) but instead report the causal effect of $EquityGain_{i,t}$ on the fraction of the purchased property's transaction price that is represented by $PricePremium_{i,t}$. Results relate to the full sample of matched household moves. All dollar amounts are in $100,000 units. Controls and fixed effects are included as indicated. The Kleibergen-Paap rk Wald F statistic is reported for all 2SLS specifications. t-statistics in parentheses are heteroskedasticity-robust and clustered at both the purchase county and transaction year levels. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Price Premium, House Being Purchased				Price Premium Percent, House Being Purchased	
	OLS	2SLS	2SLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)
Equity Gain,	-0.0157***	0.0600***	0.0603***	0.0695***	0.0157***	0.0211***
House Being Sold	(-3.41)	(4.53)	(4.53)	(3.98)	(3.75)	(4.49)
Recent Renovation Controls, House Being Purchased			X	X	X	X
Zip Median HP of Sold Home at Purchase	X	X	X	X	X	X
Five Interacted Property Sold Characteristic FE	X	X	X	X	X	X
Years Lived in Sold Home FE	X	X	X	X	X	X
Sale Zip × Transaction Year FE	X	X	X	X	X	X
Purchase Zip × Transaction Year FE	X	X	X	X	X	X
Sale County × Purchase County × Transaction Year FE				X		X
Instrumental Variable		Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period
Observations	2,911,155	2,911,155	2,911,155	2,343,372	2,911,155	2,343,372
Adj. R^2	0.022					
Weak ID KP F Stat		226.5	226.5	179.2	226.5	179.2

Table 4

Effects of Equity Gain on Future Realized Returns

This table reports estimates of the effect of the equity gain from a sold property on the future equity gain realized upon the sale of the subsequently purchased property. Consequently, the sample is limited to transactions where we observe a future sale. The specifications in columns (1) and (2) are similar to that of Equation 6. The dependent variable, however, is the dollar amount of equity gain realized upon the future sale of the newly purchased property, and the equity gain on the sold property is instrumented with the zip-level change in house prices over the holding period. Columns (3)and (4) report the OLS estimates of future equity gain on the price premium paid for the house. All dollar amounts are in $100,000 units. Controls and fixed effects are included as indicated. The controls *Renovation during Future Holding Period Controls* are constructed identically to the *Recent Renovation Controls, House Being Purchased* used in other specifications (and detailed in Section 4.2), but instead measure building permits completed by the moving household over their period of ownership of the purchased home. The Adjusted R^2 is reported for all OLS specifications and the Kleibergen-Paap rk Wald F statistic is reported for all 2SLS specifications. Reported t-statistics in parentheses are heteroskedasticity-robust and clustered at both the purchase county and transaction year levels. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Future Equity Gain, House Being Purchased		Future Equity Gain, House Being Purchased	
	2SLS	2SLS	OLS	OLS
	(1)	(2)	(3)	(4)
Equity Gain, House Being Sold	-0.369***	-0.371***		
	(-4.96)	(-5.05)		
Price Premium, House Being Purchased			-1.086***	-1.082***
			(-51.11)	(-50.81)
Renovation during Future Holding Period Controls		X		X
Zip Median HP of Sold Home at Purchase	X	X	X	X
Five Interacted Property Sold Characteristic FE	X	X	X	X
Years Lived in Sold Home FE	X	X	X	X
Sale Zip × Transaction Year FE	X	X	X	X
Purchase Zip × Transaction Year FE	X	X	X	X
Instrumental Variable	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period		
Sample	Sold Purchased Home	Sold Purchased Home	Sold Purchased Home	Sold Purchased Home
Observations	1,363,233	1,363,233	1,363,233	1,363,233
Adj. R^2			0.455	0.457
Weak ID KP F Stat	122.8	122.6		

Table 5

Benchmarking and Beliefs

This table reports results related to estimations of specifications similar to that of Equation 6 and column (2) of Table 3. Column (1) includes an indicator for the median zip house price of the purchased property being less than the median zip house price of the sold property, as well as an interaction between $EquityGain_{i,t}$ and an indicator for purchase zip lower price than sale zip, instrumented with an interaction between $\Delta HPI^S_{z,t}$ and the indicator for purchase zip lower price than sale zip. Column (2) includes an an indicator for the combined loan-to-value ratio (CLTV) of the purchased property being greater than 80%, as well as an interaction between $EquityGain_{i,t}$ and this indicator, instrumented with an interaction between $\Delta HPI^S_{z,t}$ and this indicator. Column (1) is based on the subsample of out-of-zip moves, while Column (2) is based on the full sample of matched household moves, further restricted to observations with valid measures of CLTV. All dollar amounts are in $100,000 units. Controls and fixed effects are included as indicated. The Kleibergen-Paap rk Wald F statistic is reported for all 2SLS specifications. Reported t-statistics in parentheses are heteroskedasticity-robust and clustered at both the purchase county and transaction year levels. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Price Premium, House Being Purchased	Price Premium, House Being Purchased
	2SLS	2SLS
	(1)	(2)
Equity Gain, House Being Sold	0.0580***	0.0696***
	(3.99)	(3.97)
Purchase Zip Lower Price Than Sale Zip, Indicator	0.0187***	
	(6.56)	
Purchase Zip Lower Price × Equity Gain	-0.00820***	
	(-3.72)	
CLTV of Sold Home at Purchase >80%, Indicator		-0.000194
		(-0.05)
CLTV of Sold Home at Purchase >80% × Equity Gain		0.00483
		(1.65)
Recent Renovation Controls, House Being Purchased	X	X
Zip Median HP of Sold Home at Purchase	X	X
Five Interacted Property Sold Characteristic FE	X	X
Years Lived in Sold Home FE	X	X
Sale Zip × Transaction Year FE	X	X
Purchase Zip × Transaction Year FE	X	X
Instrumental Variables	Zip ΔHPI over Sold Home Holding Period and Interaction	Zip ΔHPI over Sold Home Holding Period and Interaction
Sample	Out-of-Zip Moves	Full
Observations	2,355,927	710,104
Weak ID KP F Stat	113.1	88.29

Table 6

Price Premia are Decreasing in Information

This table reports results related to estimations of specifications similar to that of Equation 6 and column (2) of Table 3. Column (1) includes an additional interaction between $EquityGain_{i,t}$ and a continuous measure of the moving household's years lived in the sold home, instrumented with an interaction between $\Delta \text{HPI}^{S}_{z,t}$ and the years in sold home. Column (2) includes an additional interaction between $EquityGain_{i,t}$ and an indicator for whether the moving household's years lived in the sold home is above the median observed in the sample, instrumented with an interaction between $\Delta \text{HPI}^{S}_{z,t}$ and the years in sold home above median indicator. The level terms in columns (1) and (2) are absorbed by the fixed effects, and the sample is limited to the sub-set of matched household moves where both the sold and purchased properties are in the same county ("local moves"). Column (3) includes a measure of the local purchase neighborhood's historical transaction volume, as well as an interaction between $EquityGain_{i,t}$ and historical transaction volume, instrumented with an interaction between $\Delta \text{HPI}^{S}_{z,t}$ and historical transaction volume. Column (4) includes an additional interaction between $EquityGain_{i,t}$ and a measure of the standard deviation of historical price premia in the local purchase neighborhood, instrumented with an interaction between $\Delta \text{HPI}^{S}_{z,t}$ and that standard deviation, as well as a level of the standard deviation term. Column (5) includes an additional interaction between $EquityGain_{i,t}$ and a measure of the standard deviation of historical transaction prices in the local purchase neighborhood, instrumented with an interaction between $\Delta \text{HPI}^{S}_{z,t}$ and that standard deviation, as well as a level of the standard deviation term. Columns (3) through (5) use the full sample of matched household moves, further restricted to observations with valid measurements of historical transaction volume, and standard deviations of price premia and transaction prices, respectively. All dollar amounts are in \$100,000 units. Standard deviation measures are divided by 100. Controls and fixed effects are included as indicated. The Kleibergen-Paap rk Wald F statistic is reported for all 2SLS specifications. Reported t-statistics in parentheses are heteroskedasticity-robust and clustered at both the purchase county and transaction year levels. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Price Premium, House Being Purchased				
	2SLS	2SLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)	(5)
Equity Gain, House Being Sold	0.0794** (2.46)	0.0664** (2.16)	0.0678*** (4.94)	0.0396** (2.56)	0.0396** (2.74)
Years Lived in Sold Home × Equity Gain	-0.00289*** (-4.03)				
Above Median Years Lived in Sold Home (Ind.) × Equity Gain		-0.0181** (-2.13)			
Historical Transaction Volume in Purchase Area, 1/2-Mile, 0-90 Days			-0.000216* (-1.83)		
Historical Transaction Volume × Equity Gain			-0.000302*** (-4.53)		
Historical Price Premium St. Dev. in Purchase Area, 1/2-Mile, 0-90 Days				0.0000967*** (8.54)	
Historical Price Premium St. Dev. × Equity Gain				0.0000159*** (4.53)	
Historical Price St. Dev. in Purchase Area, 1/2-Mile, 0-90 Days					0.0000256*** (7.09)
Historical Price St. Dev. × Equity Gain					0.00000661*** (4.64)
Recent Renovation Controls, House Being Purchased	X	X	X	X	X
Zip Median HP of Sold Home at Purchase	X	X	X	X	X
Five Interacted Property Sold Characteristic FE	X	X	X	X	X
Years Lived in Sold Home FE	X	X	X	X	X
Sale Zip × Transaction Year FE	X	X	X	X	X
Purchase Zip × Transaction Year FE	X	X	X	X	X
Instrumental Variables	Zip ΔHPI over Sold Home Holding Period and Interaction	Zip ΔHPI over Sold Home Holding Period and Interaction	Zip ΔHPI over Sold Home Holding Period and Interaction	Zip ΔHPI over Sold Home Holding Period and Interaction	Zip ΔHPI over Sold Home Holding Period and Interaction
Sample	Local Moves	Local Moves	Full	Full	Full
Observations	1,351,987	1,351,987	2,877,345	2,532,998	2,655,229
Weak ID KP F Stat	56.53	57.07	109.6	94.51	100.4

Table 7

Equity Gains Cause Neighborhood Price Spillovers

This table reports results related to estimations of specifications similar to that of Equation 6. The left-hand side variable is, however, instead a measure of the average sales price in the immediate neighborhood surrounding the purchased property in the time period and geography relevant to the respective column, $\text{NeighborhoodPrice}_{i,N,t,T}$ (as calculated in Equation 7). Columns (1), (3), (5), and (7) measure the average price across transactions occurring between 0-180 days after the purchase transaction, while columns (2), (4), (6), and (8) measure across 0-360 days after the purchase transaction. Columns (1) and (2) average transactions across a 1/2-mile radius circle surrounding the purchase property while columns (3) and (4), (5) and (6), and (7) and (8) average across 1-mile, 1 1/2-mile, and 2-mile radii, respectively. In all cases the average price is measured excluding the purchase transaction. Results relate to the full sample of matched household moves, subject to there being at least one subsequent transaction in the time period and geography relevant to the respective column. All dollar amounts are in $100,000 units. Controls and fixed effects are included as indicated, with "at matched distance" referring to the geography relevant to the respective column. The Kleibergen-Paap rk Wald F statistic is reported for all 2SLS specifications. Reported t-statistics in parentheses are heteroskedasticity-robust and clustered at both the purchase county and transaction year levels. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Average Sales Price within 1/2-Mile of Home Purchase		Average Sales Price within 1-Mile of Home Purchase		Average Sales Price within 1 1/2-Mile of Home Purchase		Average Sales Price within 2-Miles of Home Purchase	
	0-180 Days	0-360 Days	0-180 Days	0-360 Days	0-180 Days	0-360 Days	0-180 Days	0-360 Days
	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Equity Gain, House Being Sold	0.0850***	0.0663**	0.0829***	0.0539**	0.0649**	0.0392	0.0599**	0.0351
	(2.99)	(2.15)	(3.43)	(2.09)	(2.73)	(1.61)	(2.65)	(1.51)
Four Quarterly Historical Average Prices, At Matched Distance	X	X	X	X	X	X	X	X
Zip Median HP of Sold Home at Purchase	X	X	X	X	X	X	X	X
Five Interacted Property Sold Characteristic FE	X	X	X	X	X	X	X	X
Years Lived in Sold Home FE	X	X	X	X	X	X	X	X
Sale Zip × Transaction Year FE	X	X	X	X	X	X	X	X
Purchase Zip × Transaction Year FE	X	X	X	X	X	X	X	X
Instrumental Variable	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period
Observations	2,596,487	2,599,936	2,799,868	2,800,834	2,845,314	2,845,626	2,860,750	2,860,872
Weak ID KP F Stat	218.6	220.5	237.8	238.1	244.6	244.7	246.8	246.8

Table 8

Commuting Zone Level Equity Inflows Increase House Prices

This table reports results related to estimations of specification similar to that of Equation 8. The left-hand side variable is a measure of the log change in the FHFA House Price Index (aggregated to the CZ-level from population-weighted county changes). The key right-hand variable of interest is the estimated total positive housing equity gain of in-migrants per local household $eg_{i,t}^{\text{non-local}}$ (as calculated in Equation 9). Columns estimated with 2SLS use the instrumental variable $\widetilde{eg}_{i,t}^{\text{non-local}}$ as constructed in equation 10, using data only for movers coming from outside a 50 mile radius around the commuting zone. Results relate to the panel of CZ-year cells for 2006-2020 for which the required data is available (2006-2018 only for column 6). The Adjusted R^2 is reported for all OLS specifications and the Kleibergen-Paap rk Wald F statistic is reported for all 2SLS specifications. Controls and fixed effects are included as indicated. Reported t-statistics in parentheses are heteroskedasticity-robust and clustered at both the CZ and transaction year levels. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Predicted Log Out-of-CZ Equity Inflow, Per Capita	100 × Δ Log House Price Index, CZ-Year					
	First Stage	OLS	2SLS	2SLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log Out-of-CZ Equity Inflow Instrument, Per Capita	0.677***						
	(7.16)						
Predicted Log Out-of-CZ Equity Inflow, Per Capita		0.676***	3.823***	4.222**	3.814***	3.830**	0.586
		(3.82)	(3.47)	(2.60)	(3.40)	(3.02)	(0.42)
Predicted Log Out-of-CZ Equity Inflow, × 2nd Quint. Land Constraints							0.838
							(1.50)
Predicted Log Out-of-CZ Equity Inflow, × 3rd Quint. Land Constraints							2.830**
							(2.59)
Predicted Log Out-of-CZ Equity Inflow, × 4th Quint. Land Constraints							3.311**
							(2.55)
Predicted Log Out-of-CZ Equity Inflow, × 5th Quint. Land Constraints							3.889**
							(2.19)
Commuting Zone FE	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X
Log Predicted Out-of-CZ In-Mig., HHs				X			
Log CZ Home Sales, per HH					X		
Industry Wage Shock						X	
Industry Wage Shock×Land Constraint						X	
Instrumental Variable			Log Exp. Out-of-CZ Equity Inflow, Per Capita	Log Exp. Out-of-CZ Equity Inflow, Per Capita	Log Exp. Out-of-CZ Equity Inflow, Per Capita	Log Exp. Out-of-CZ Equity Inflow, Per Capita	Log Exp. Out-of-CZ Equity Inflow, Per Capita
Observations	4,990	4,997	4,990	4,990	4,990	3,947	4,990
Adj. R^2	0.825	0.493					
Weak ID KP F Stat			51.30	38.55	50.86	29.23	8.310

Table 9

Local Movers vs. Non-Local Movers

This table reports results related to estimations of specification similar to that of Equation 6. Columns (1) and (2) are similar to column (2) of Table 3 and columns (3) and (4) are similar to column (1) of Table 7. Columns (1) and (3) include indicators for the distance, in terms of political boundaries, between the sold and the purchased properties, as well as interactions between $EquityGain_{i,t}$ and those indicators, instrumented with an interaction between $\Delta HPI^{S}_{z,t}$ and the relevant indicator. The left out indicator level is for In-Zip moves. Columns (2) and (4) include the distance, in miles, between the sold and the purchased properties, as well as an interaction between $EquityGain_{i,t}$ and the distance, instrumented with an interaction between $\Delta HPI^{S}_{z,t}$ and the move distance. Results relate to the full sample of matched household moves, with columns (2) and (4) further restricted to observations with valid measurements of distance between the sold and purchased properties, and columns (3) and (4) subject to there being at least one subsequent transaction in the time period and geography relevant to the respective column. All dollar amounts are in $100,000 units. Controls and fixed effects are included as indicated, with “at matched distance” referring to the geography relevant to the respective column. The Kleibergen-Paap rk Wald F statistic is reported for all 2SLS specifications. Reported t-statistics in parentheses are heteroskedasticity-robust and clustered at both the purchase county and transaction year levels. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Price Premium, House Being Purchased		Average Sales Price, within 1/2-Mile and 0-180 Days of Home Purchase	
	2SLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)
Equity Gain, House Being Sold	0.0836***	0.0803***	0.0945***	0.0898***
	(6.25)	(5.90)	(3.24)	(3.13)
Out-of-Zip, In-County, Move Indicator	0.0174***		0.00475	
	(3.07)		(1.61)	
Out-of-County, In-State Move Indicator	0.0288***		0.00471	
	(2.98)		(1.15)	
Out-of-State, Move Indicator	0.0368**		0.00560	
	(2.78)		(0.83)	
Out-of-Zip, In-County Move Indicator × Equity Gain	-0.0161***		-0.00735***	
	(-6.52)		(-3.64)	
Out-of-County, In-State Move Indicator × Equity Gain	-0.0247***		-0.0114***	
	(-6.33)		(-3.73)	
Out-of-State Move Indicator × Equity Gain	-0.0374***		-0.0143***	
	(-8.61)		(-3.86)	
Log Move Distance		0.00587***		0.000844
		(3.02)		(0.85)
Log Move Distance × Equity Gain		-0.00530***		-0.00174***
		(-8.52)		(-3.51)
Four Quarterly Historical Average Prices, At Matched Distance			X	X
Recent Renovation Controls, House Being Purchased	X	X		
Zip Median HP of Sold Home at Purchase	X	X	X	X
Five Interacted Property Sold Characteristic FE	X	X	X	X
Years Lived in Sold Home FE	X	X	X	X
Sale Zip × Transaction Year FE	X	X	X	X
Purchase Zip × Transaction Year FE	X	X	X	X
Instrumental Variables	Zip ΔHPI over Sold Home Holding Period and Interactions	Zip ΔHPI over Sold Home Holding Period and Interaction	Zip ΔHPI over Sold Home Holding Period and Interactions	Zip ΔHPI over Sold Home Holding Period and Interaction
Observations	2,911,155	2,840,685	2,596,487	2,563,317
Weak ID KP F Stat	55.31	107.7	53.48	106.4

Internet Appendix

A.1 Match Quality and Coverage

In this section we perform diagnostics with regards to the quality and coverage of our deed matching process within both the universe of deeds contained in the Zillow Transaction and Assessments (ZTRAX) data as well as the universe of out-of-county moves as recorded in the IRS tax return data. ZTRAX covers approximately 220 million house transactions that occur between 1996 and 2021. We focus on deeds coded as owner-occupied single-family residences and ignore transactions with institutional ("non-individual") buyer or seller names, resulting in a sample of approximately 111.1 million house transactions to be searched across in order to find potential moves.

We first match based on names, first by matching last-first-middle uniquely, then by collapsing the middle name to just a first initial, focusing only on potential moves that occur across properties that were purchased less than 274 days after, but no more than 182 days before, the sale transaction. Because deed recordings bunch on particular days of the week, these dates are chosen to be round weeks of three-fourths and one-half of a year, respectively. We privilege the full name match (relative to just middle initial) as well as matches based on multiple names listed on both deeds and matches confirmed by cross-referencing mailing address and property address deeds, only retaining matches that have unique "strongest" matches at each level on either the buyer or seller side, and then iteratively removing transactions from the pool, in order to err away from "false positive" matches at each step.

This matching process yields a set of 19.8 million moves, i.e. for 19.8m transactions we know what property the buyer just sold, and for a (potentially) different 19.8m transactions we know what property the seller will have purchased[29]. This results in an overall match rate of 17.8%.

It is important to understand the nature of any selection into our matched sample. While

[29]The intersection of these two-sides of the same matching process yields 35.3m unique transactions, and we see both where the buyer came from and where the seller went to, for 4.3m of them.

the identification strategy we use alleviates concerns about sample selection biasing our within-sample estimates, selection might limit the ability to extrapolate our results out-of-sample. There are two potential concerns regarding selection into our matched sample. First, do geographies differ significantly with respect to the quality of their deed recording practices? Second, given that we are aiming to measure the causal effect of equity gains on future home purchasing behavior, we of necessity have to focus on homeowner-to-homeowner moves.

If counties differ significantly in their deed recording practices, this could lead to moves into and out of particular geographies being more likely to be selected into our sample. Recording duties are performed at the county-level and so, given the fixed effects used throughout our transaction-level analyses and the nature of our price premium repeat-sales methodology, selection of this type will not affect the causal interpretation of our estimates. Instead, move selection effects at a geographic level might challenge the external validity of our measures. Figure A.1 displays, for every county with at least one potentially "matcheable" sale over the sample period, the percentage of those moves that we were able to match. While the range of match percentages is quite wide (likely due to a few counties having very few eligible transactions), the interquartile range of county level match percentages is 13.7% to 18.3%, and 90% of counties have match percentages between 10.1% and 22.2%. Figure A.2 calculates the match percent instead at the state-level (plus Washington, DC). Here, the distribution of match percentages is significantly compressed, with an interquartile range of 17.2% to 20.7%, and 90% of states have match percentages between 15.4% and 22.9%. Finally, Figure A.3 plots this state-level match percent (red line, right axis) against the transaction volume at the state level (blue bars, left axis), where states are sorted from highest to lowest transaction volume by state from left to right. The match percentage at the state-level varies within a tight window as previously described, and is uncorrelated with state-level transaction volume, indicating that our matching process does not privilege moves either within or across political boundaries.

While our match rate is consistent across geographies, our analysis requires us to observe transaction prices which ultimately eliminates moves to or from non-disclosure states from our sample. Note that we do observe prices for a very small set of transactions in non-disclosure states. These prices might be erroneous, or the seller might have voluntarily disclosed the price. For our main analysis, we drop these observations from our sample. However, the results are not sensitive to the decision of whether or not to include these observations. Our regression sample is also missing data from Indiana and Maine. While not non-disclosure states, Indiana and Maine have missing or zero sales price values populated for 92.7% and 98.8%, respectively, of their recorded transactions. Given our fixed effect structure and the size of the match conditioned sample, this causes moves into and out of these areas to be dropped from the regression sample. Importantly, our rate of matching deeds in those states is not affected by the missing sales price data.

Given that our study focuses on the equity gain on a home and future home purchase behavior, we of necessity condition solely on homeowner to homeowner moves. This focus primarily excludes first-time home buyers, as well as households exiting the housing market, but also removes vacation and investment property purchases. A back-of-the-envelope calculation to adjust our match rate for the volume of first-time home buyers (collected from the National Association of Realtors' estimates of the annual percentage of nation-wide purchases that are first-time home buyers) covering transactions between 2003 and 2021, suggests there were approximately 58 million eligible deeds recorded for non-first-time home buyers over that period. This yields a total estimated matched rate of 26.2% of non-first time home purchases.

The selection out of first-time home buyers likely impacts the types of houses that appear in our sample since first-time buyers are disproportionately likely to purchase either older or smaller, and as a result cheaper, homes. Figure A.4 suggests that our match rate is not varying with respect to the age of the home. Figures A.5 and A.6 plot the kernel densities for the full Zillow sample (blue) and our sample of matched deeds (red) based on the sales price and square footage of the property, respectively. Both distributions are shifted slightly to the right, consistent with non-first time buyers purchasing bigger, more expensive houses, but are otherwise strikingly similar. While there exists a selection effect against first-time home buyers, because these buyers do not have pre-existing housing wealth, they are ultimately irrelevant for our study design.

The IRS tax return data presents us with the opportunity to baseline our sample against a slightly different universe of moves—out-of-county moves irrespective of whether they are homeowner to homeowner moves. Conditional on out-of-county moves from 1996 to 2021 and between counties with more than ten moves in a given year in the IRS data (the IRS data is left censored at this level), we match 6.3% of the total IRS tax return move volume. This represents approximately a third of our headline match rate into the ZTRAX deed sample of 17.8%. Given that only approximately 60% of U.S. households are homeowners, that renters are likely to move more frequently than homeowners, and that we will also be unable to match transitions into and out of homeownership, we view these numbers to be both consistent with each other and significant.

Finally, we compare the cross-sectional dynamics of our matched move flows with that implied by the IRS tax return move data by regressing the natural log of the total IRS tax return move flow between two counties (summed across all years with measured IRS move flows) on the natural log of all of our matched move flows between the same two counties (with the same cross-section and time-series conditioning) and find a coefficient of 0.94 with an R-squared of 82%. Figure A.7 displays a scatter plot of these underlying data. Visually appearing slightly above the mass of plotted county move pairs are the most under-matched of county move pairs. Conditional on large numbers of movers in the ZTRAX data (at least 55, visually the value of 4 on the displayed x-axis), the vast majority of these low-match county pairs are for moves within the greater New York City area, likely being driven by disproportionately high rates of rentals. Figure A.8 displays a scatter plot related to a similar regression, but including a fixed effect for the county the mover is leaving, and finds a coefficient of 1.04 with an R-squared of 87%. Overall, the move patterns in our sample match those of overall moves in the IRS data.

A.2 Aggregate effect estimation details

This section details the methodology for constructing the measures of cross-CZ housing capital flows and instruments.

A.2.1 Estimating housing equity gain inflows

The variable of interest for determining the impact of housing capital flows is the total inflow of equity gains into a CZ as a result of inbound migration. However, this quantity cannot be directly measured in our property-level data as we do not necessarily have full coverage of all transactions in a CZ. Instead, we combine our data on average equity gains among buyers with data on total movers between counties from the Internal Revenue Service's Statistics of Income (SOI) database. Specifically, we use the ZTRAX data to estimate the average equity gain among observed out-of-CZ buyers in destination c as:

$$\overline{\text{EquityGain}}_{c,t}^{\text{non-local}} = \left(\frac{\sum_{i}^{N_{c,t}^{\text{ZTRAX}}} \text{EquityGain}_{i,t,c} \times \mathbb{1}[\text{Out-of-CZ Origin}]_{i,t,c}}{\sum_{i}^{N_{c,t}^{\text{ZTRAX}}} \mathbb{1}[\text{Out-of-CZ Origin}]_{i,t,c}} \right),$$

where we define $\mathbb{1}[\text{Out-of-CZ Origin}]_{i,t,c}$ to indicate movers that are coming from a CZ for which each county centroid is at least 50 miles away from each county in the destination CZ. We impose this minimum distance between geographies to account for both the possibility of CZ boundaries mismeasuring housing markets as well as any identification issues arising from origin geographies being subject to the same idiosyncratic local housing market shocks as the destination CZ.

Second, we scale this average equity gain $\overline{\text{EquityGain}}^{\text{non-local}}$ into an estimate of total equity gains from all non-local movers per local household by calculating[30]

$$eg_{ct}^{\text{non-local}} = \overline{\text{EquityGain}}_{ct}^{\text{non-local}} \times \frac{\text{OutOfCZMovers}_{ct}^{\text{IRS}}}{\text{ResidentHHs}_{c,2006}^{\text{IRS}}}, \tag{A.2.1}$$

where $\text{OutOfCZMovers}_{ct}^{\text{IRS}}$ and $\text{ResidentHHs}_{c,2006}^{\text{IRS}}$ are the IRS estimates of total household inflows into the commuting zone c from origin CZs at least 50 miles away and total local households residing in the CZ in 2006.[31]

A.2.2 Housing equity gain inflow instrument

We construct an instrument that captures plausibly exogenous equity gain flows between CZs by estimating the components corresponding to the following *exogenous* predicted equity gain inflows from out-of-area origins for each CZ:

$$\widetilde{eg}_{ct}^{\text{non-local}} = \frac{[\text{Predicted Avg. Equity Gain for Movers}] \times [\text{Predicted Out-of-Area Inmigration}]}{\text{ResidentHHs}_{c,2006}^{\text{IRS}}}.$$

First, to construct a plausibly exogenous flow of *predicted movers* for each origin-destination CZ pair, we use historical migration links as predictors of contemporaneous migration flows (Howard, 2020; Schubert, 2021). That is, the predicted number of movers from k to c is constructed from IRS migration data as a "shift-share" instrument of the form

$$\widehat{Mig}_t^{k\to c} = \left(\frac{MigShare_{`90-`99}^{k\to c}}{1 - MigShare_{`90-`99}^{k\to c}}\right) \times OutMig_t^{k\to\neg c},$$

where $MigShare_{`90-`99}^{k\to c}$ is the average share of outflows from CZ k that go to CZ c during 1990-1999, and $OutMig_t^{k\to\neg c}$ is the total outflow of migrants in year t to all locations *other* than CZ

[30] Note that we do not scale the total inflow by the share of homeowners among movers, as precise data on homeownership status for origin-destination pair movers is not available on an annual basis (e.g. the ACS data is not granular enough to compute reliable averages for such a small subgroup). However, note that this likely does not affect the estimation much as the log specification with CZ fixed effects would control for any constant differences in homeowner shares among movers into different CZs.

[31] 2006 is the first year of our panel for the aggregate effects estimation.

c that are at least 50 miles away.[32] The intuition for using this measure of expected migration flows is that it captures the degree to which the characteristics of CZ k are prompting outflows in period t, and the average share of those outflows that would be expected to go towards CZ c—for instance, because of low migration costs or historic family connections between these locations—but without using any period t variation from CZ c itself that might potentially be correlated with local house price trends in c. Moreover, when aggregating these predicted flows from other CZs, we will again omit any flows from CZs that are less than 50 miles away, in order to eliminate bias from the migration dynamics of CZs that may have overlapping local housing and labor markets with the destination CZ of interest.

Similarly, the predicted average equity gain among people moving into CZ c is constructed without using data on the characteristics of contemporaneous flows from k to c, which might be selected based on destination characteristics. Instead, we assume that movers from high equity gain locations are also generally more likely to have higher equity gains. Thus, destination CZ c is expected to have higher average equity gains among its incoming households if it has higher historic migration exposure to CZs that are experiencing high equity gains among their house sellers in period t:

$$\overline{EquityGain}_{ct}^{\text{origins}} = \sum_{k:\,dist(\text{CZ(k)},\text{CZ(c)})>50\text{mi.}} \left(\frac{\widehat{Mig}_t^{k\to c}}{\sum_{k:\,dist(\text{CZ(k)},\text{CZ(c)})>50\text{mi.}} \widehat{Mig}_t^{k\to c}} \right) \times \overline{EquityGain}_{kt}$$

Here, $\overline{EquityGain}_{kt}$ is the average gross equity gain among *all* sellers in CZ k in period t in the ZTRAX data, without netting out equity losses (under the assumption that one mover's lack of funds would not negate another mover's willingness to pay a premium). Moreover, we again omit the housing equity gains in any origin CZs that are within 50 miles of CZ c to avoid bias from common shocks to nearby local housing markets. Combining these measures as shown above,

[32]The reason for dividing by $(1 - MigShare^{k\to c}_{\}90-\}99})$ is to re-scale the leave-one-out outflows to the expected magnitude if CZ c flows of historic proportions had been included.

our instrument for equity gains (per local household) flowing into CZ c from other CZs is then

$$\widetilde{eg}_{ct}^{\text{non-local}} = \underbrace{\left(\sum_{k:\,dist(\text{CZ(k)},\text{CZ(c)})>50\text{mi.}} \widehat{Mig}^{k\rightarrow c} \right)}_{\text{Predicted Out-of-area Inmigration}} \times \overline{EquityGain}_{ct}^{\text{origins}} \times \frac{1}{\text{ResidentHHs}_{c,2006}^{\text{IRS}}} \qquad \text{(A.2.2)}$$

This shift-share approach results in an instrument for the total equity gain inflow into CZ c in year t that does not use any contemporaneous information on the actual number or characteristics of movers with equity gains coming into c and thereby eliminates any correlation between the contemporaneous destination choices of movers and local house price dynamics in c. Instead, the instrument relies on variation across CZs in their historical exposure to migration from particular distant CZs, in conjunction with variation over time in the average equity gains in those distant CZs.

A.3 Local vs. Non-Local County by County

The result that local movers pay a larger premium as a function of equity gains may be driven by large and wealthy counties (such as Los Angeles County, CA). For these counties, where locals have experienced enormous housing equity gains, it might seem intuitive that locals pay a larger premium relative to non-locals. To test this, we run a specification similar to that of column (1) of Table 9 at an individual county level, for the 100 largest counties by observation count in our main regression sample. Rather than indicators for four classes of move distances across political boundaries, we collapse to a single binary indicator for whether the move was a non-local (i.e., out-of-county but within-state or out-of-state) move. The specification is also altered from that of Equation 6 because the focus on a single county obviates some of the fixed effect and clustering dimensions. The zip-year fixed effects for both the sale and purchase locations are replaced by a transaction year fixed effect and the purchase zip clustering dimension is dropped.

Appendix Figure A.9 displays the coefficients and 95% confidence intervals for each of these 100 counties. There are no counties where non-locals are paying a larger premium than locals as a function of their equity gain at a 95% confidence level.[33] These findings suggest both that our results are not being driven by large metropolitan areas and that the popular press narrative is not true for any individual major county.

[33]Although two counties out of the hundred tested, Naples, FL and Reno, NV (Collier and Washoe counties, respectively) , are significantly positive at the 90% level.

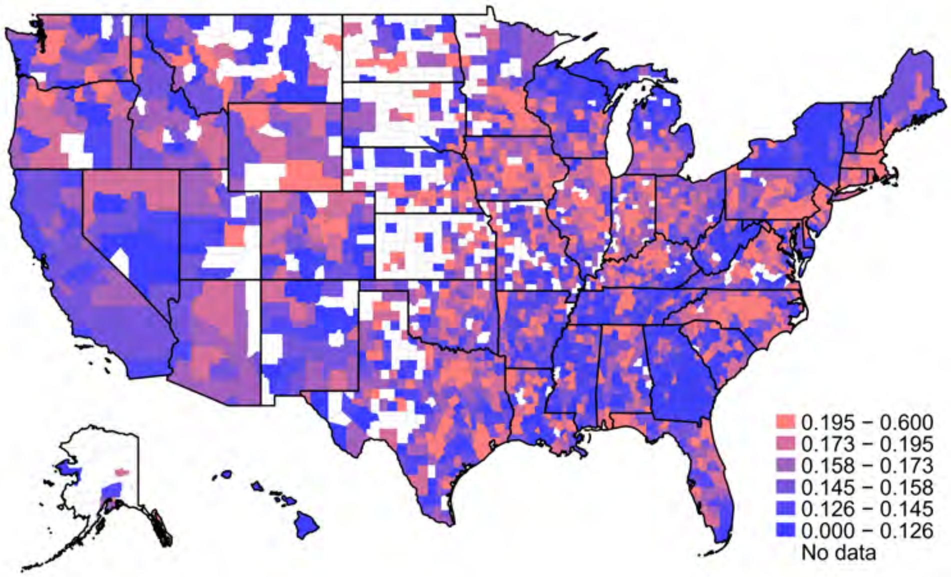

Figure A.1. **Match Percent by County** This map reports, at the county-level, the percentage of sales eligible for our matching process that were included in our match.

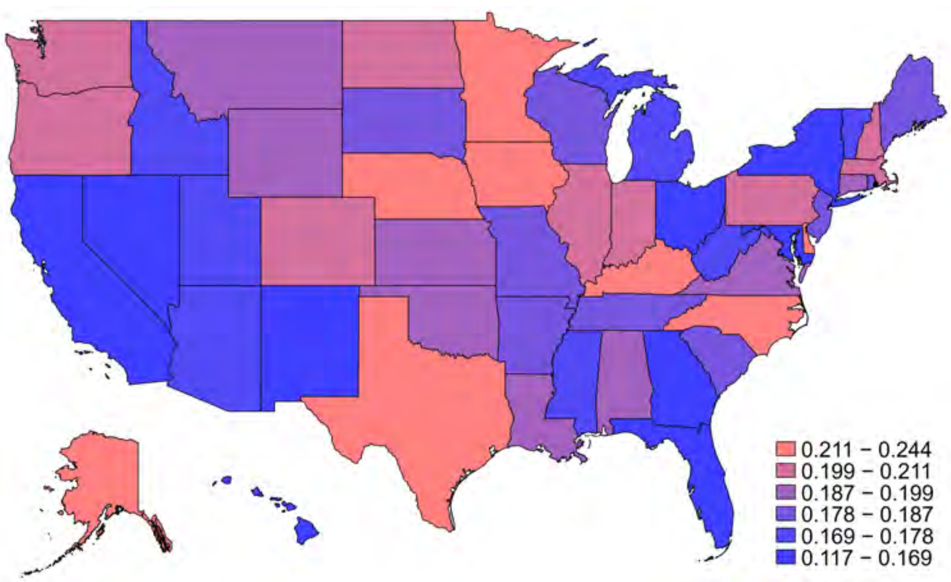

Figure A.2. **Match Percent by State** This map reports, at the state-level, the percentage of sales eligible for our matching process that were included in our match.

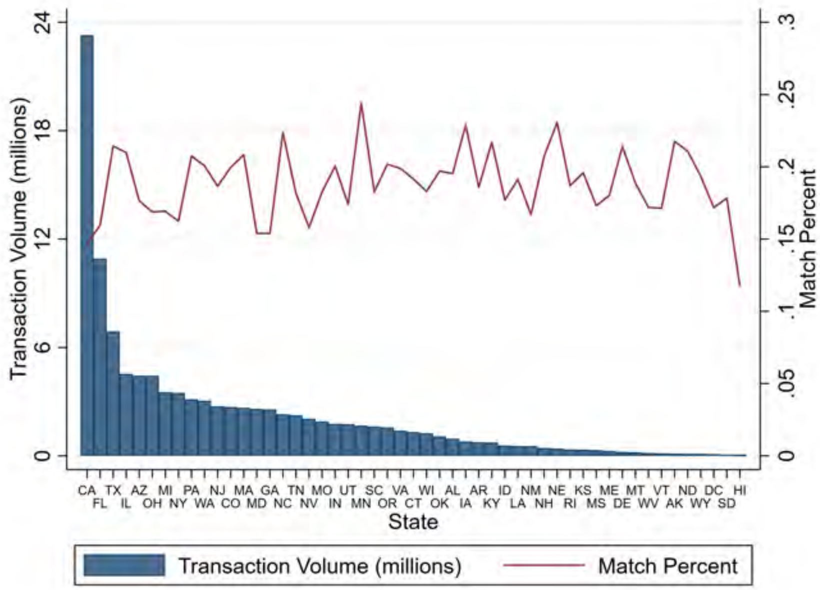

Figure A.3. Match Percent and Transaction Volume by State With the red line and on the right axis, this figure plots the same state-level match percent as in Figure A.2. The blue bars, on the left axis, report the transaction volume at the state-level. States are sorted from left to right by highest to lowest transaction volume.

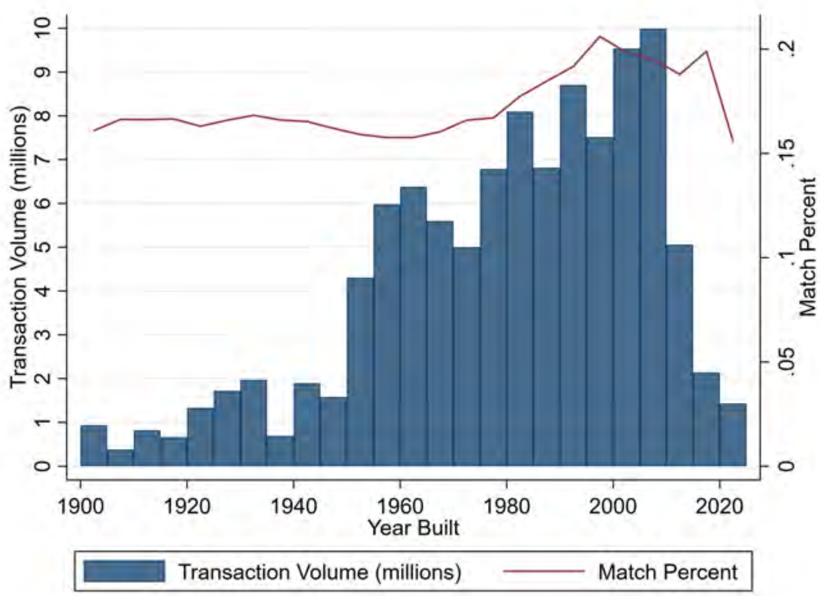

Figure A.4. Match Percent and Transaction Volume by Building Age With the red line and on the right axis, this figure plots the match percent within 5-year buckets of when the property was built. The blue bars, on the left axis, report the transaction volume for those same buckets.

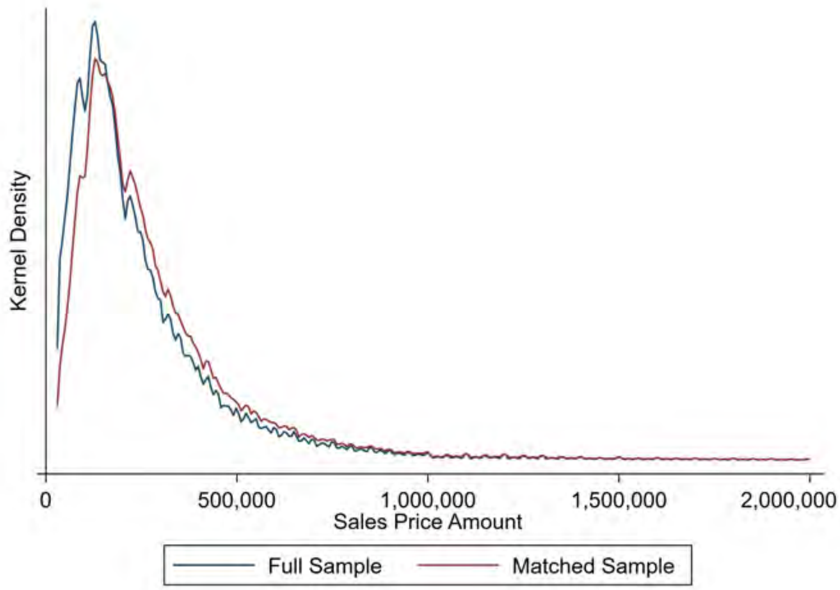

Figure A.5. Kernel Densities by Sales Price Amount - Full vs. Matched Samples This figure plots the sales price kernel densities for the full Zillow sample in blue and for our matched sample of deeds in red.

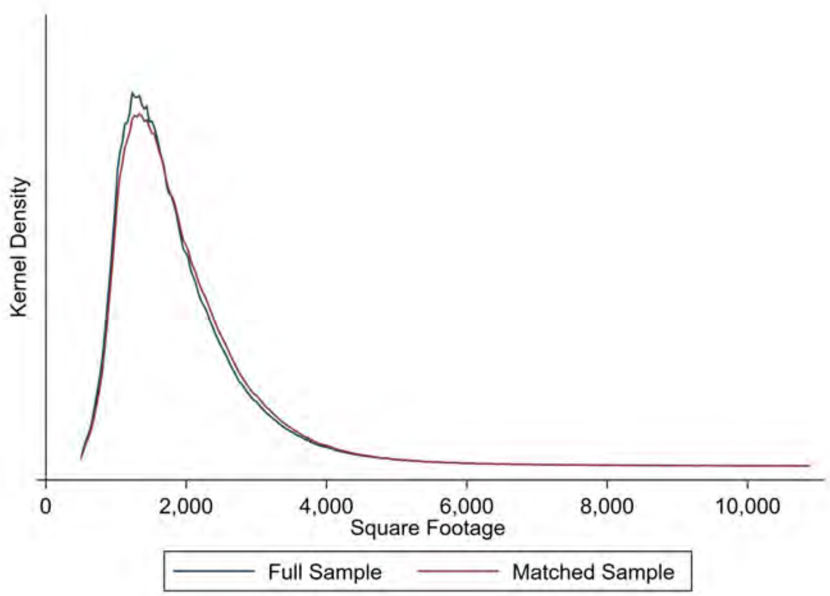

Figure A.6. Kernel Densities by Square Footage - Full vs. Matched Samples This figure plots the property square footage kernel densities for the full Zillow sample in blue and for our matched sample of deeds in red.

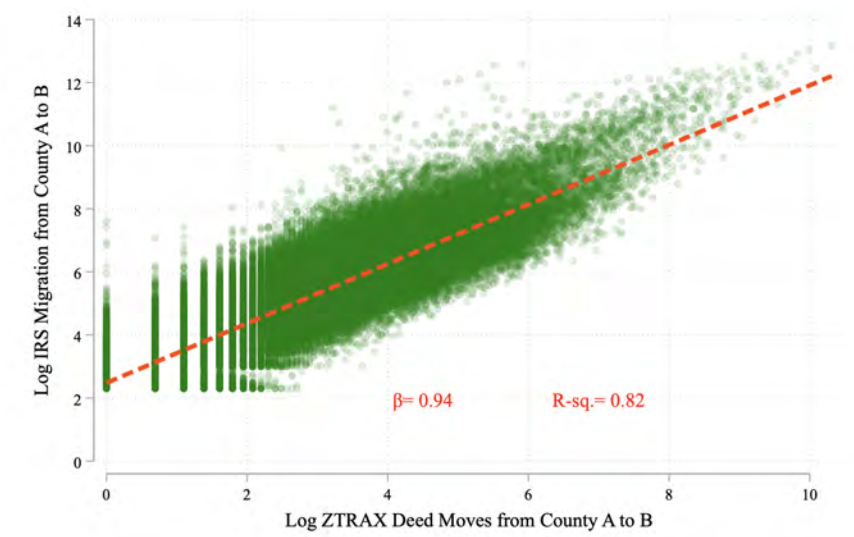

Figure A.7. ZTRAX vs IRS County to County Move Match This figure displays, in green, a scatter plot of the natural log of the total IRS tax return move flow between a county pair (on the vertical axis) and the natural log of all matched move flows between the same two counties (on the horizontal axis). Observations are summed across years, conditional on that year having measured IRS move flow. The dashed red line represents a line of best fit, and the β and R-squared of this best fit line are reported.

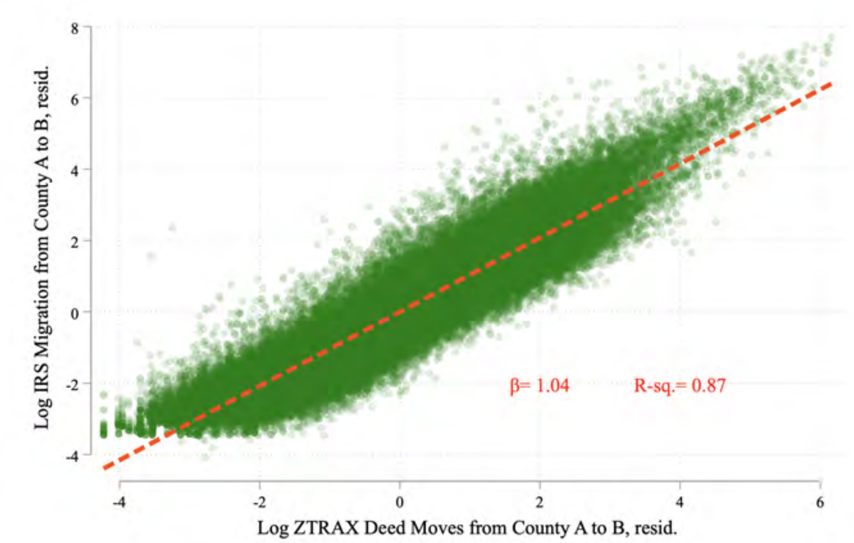

Figure A.8. ZTRAX vs IRS County to County Move Match - Residualized This figure displays, in green, a scatter plot of the natural log of the total IRS tax return move flow between a county pair (on the vertical axis) and the natural log of all matched move flows between the same two counties (on the horizontal axis), measured with a fixed effect for the county the mover is leaving. Observations are summed across years, conditional on that year having measured IRS move flow. The dashed red line represents a line of best fit with a county fixed effect, and the β and R-squared of this best fit line are reported.

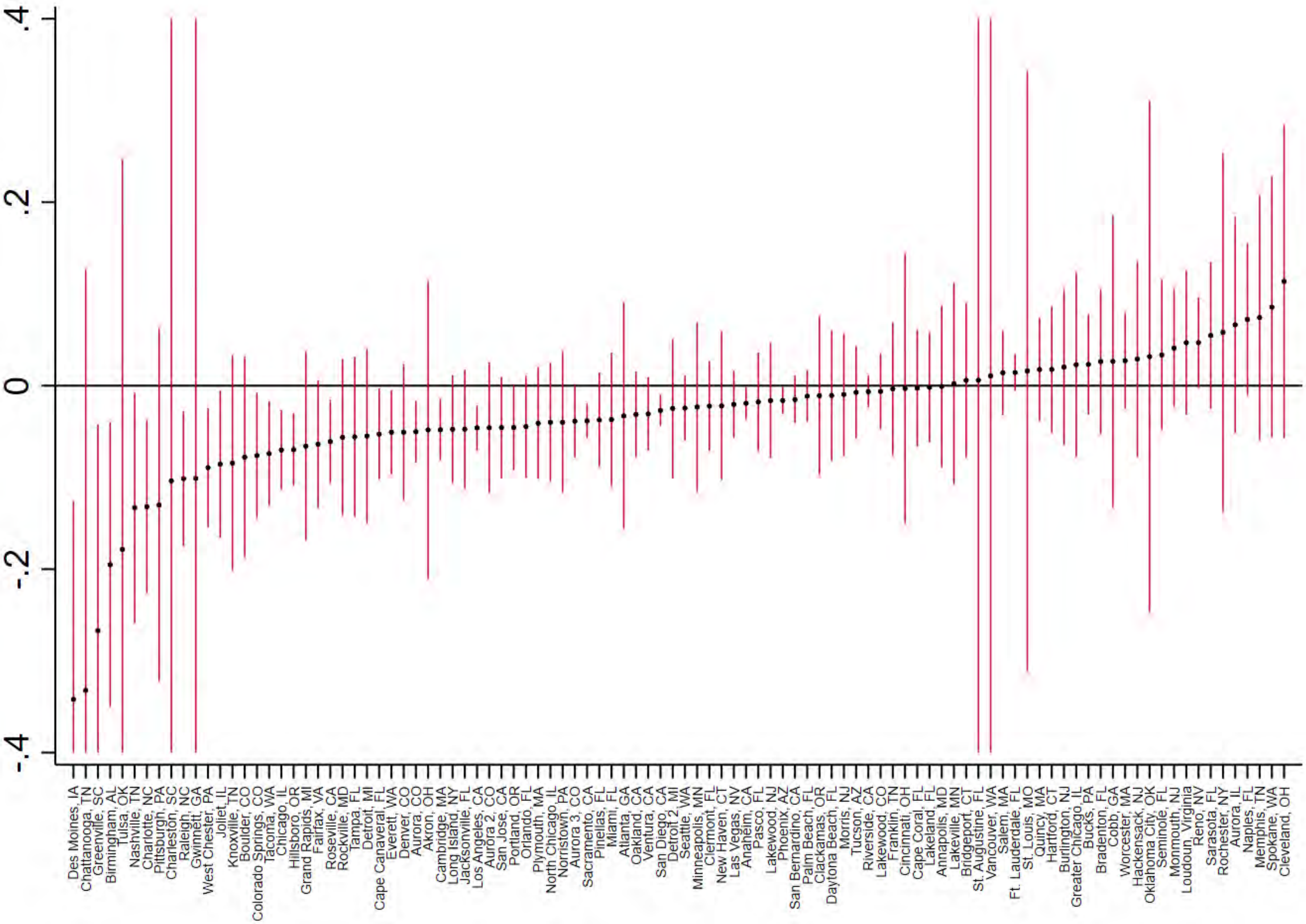

Figure A.9. Effect of Equity Gain on Price Premium for Non-Locals Relative to Locals for the 100 Largest Counties This figure presents estimates conceptually similar to that of column (2) of Table 9. Collapsing the four-fold distinction in moves across political boundary distances to simply an indicator for a non-local move (strictly out-of-county), and reporting the estimate and 95% confidence interval for the coefficient on the interaction between that non-local move indicator and equity gains, instrumented with an interaction between the indicator and our standard instrument. Fixed effects and clustering differ from the reference specification—the sale zip by year and purchase zip by year fixed effects are replaced with a single transaction year fixed effect and the purchase zip clustering dimension is removed. The upper and lower confidence intervals are truncated at -0.4 and 0.4 for aesthetic purposes. The names along the x-axis describe county-level bins, where names have been chosen to subjectively refer to the most salient aspect of the county's contents.

Table A.1

Robustness

This table reports results from estimating specifications similar to that of Equation 6 and to column (2) of Table 3. Results relate to the full sample of matched household moves, with column (4) restricted to moves of at least 3 miles or more. All dollar amounts are in $100,000 units. Controls and fixed effects are included as indicated. The instrument for equity gains in columns (1) through (5) is the change in the zip median house price over the holding period. The instrument in columns (6) and (7) is the census tract-level housing supply elasticity from Baum-Snow and Han (2023) multiplied with the change in the national median house price over the holding period. The Kleibergen-Paap rk Wald F statistic is reported for all 2SLS specifications. Reported t-statistics in parentheses are heteroskedasticity-robust and clustered at both the purchase county and transaction year levels. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Price Premium, House Being Purchased						
	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Equity Gain, House Being Sold	0.0608***	0.0547***	0.0663***	0.0541***	0.0616***	0.0427***	0.0489***
	(4.10)	(16.01)	(3.69)	(3.69)	(4.11)	(3.89)	(3.37)
Zip Median HP of Sold Home at Purchase	X	X	X	X	X	X	X
Recent Renovation Controls, House Being Purchased	X	X	X	X	X	X	X
HH Income of Zip for Sold Home at Purchase					X		
Five Interacted Property Sold Characteristic FE	X	X	X	X	X	X	X
Years Lived in Sold Home FE	X	X	X	X	X	X	X
Sale Zip × Transaction Year FE	X			X	X	X	X
Purchase Zip × Transaction Year FE	X			X	X	X	X
Transaction Calendar Month FE	X						
Sale Zip × Transaction Quarter FE		X					
Purchase Zip × Transaction Quarter FE		X					
Sale Census Tract × Transaction Year FE			X				
Purchase Census Tract × Transaction Year FE			X				
Sale County × Purchase County × Transaction Year FE							X
Instrumental Variables	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI ove Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period	Baum-Snow-Han Elasticity × Agg. HPI	Baum-Snow-Han Elasticity × Agg. HPI
Sample	Full	Full	Full	No Small Moves	Full	Full	Full
Observations	2,911,155	2,903,664	2,337,695	2,224,212	2,235,705	1,753,157	1,390,745
Weak ID KP F Stat	433.8	813.4	141.5	214.5	171.2	100.0	79.90

Table A.2

Housing Market Sophistication

This table regresses the realized return a household experiences on a home being purchased on the realized return experienced on the home being sold as evidence in support of the existence of housing market sophistication that could be contaminating naïve estimates of the relationship between equity gain and the price premium. The Adjusted R^2 is reported for all OLS specifications. Reported t-statistics in parentheses are heteroskedasticity-robust and clustered at both the purchase county and transaction year level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Annualized, Future Realized Return, House Being Purchased
	OLS
	(1)
Annualized Realized Return, House Being Sold	0.327***
	(15.12)
Zip Median HP of Sold Home at Purchase	X
Five Interacted Property Sold Characteristic FE	X
Years Lived in Sold Home FE	X
Sale Zip × Transaction Year FE	X
Purchase Zip × Transaction Year FE	X
Observations	1,294,164
Adj. R^2	0.226

Table A.3

Recent Renovations are Associated with Equity Gains

This table regresses the equity gain realized on the sale of a property on various measures of the recent renovations the sellers completed on before selling the property. The results show that the (uninstrumented) equity gain is higher following property-level improvements. Results relate to the full sample of matched household moves. All dollar amounts are in $100,000 units. Controls and fixed effects are included as indicated. The Adjusted R^2 is reported for all OLS specifications. t-statistics in parentheses are heteroskedasticity-robust and clustered at both the purchase county and transaction year levels. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Equity Gain, House Being Sold		
	OLS	OLS	OLS
	(1)	(2)	(3)
Renovation Completed, 180 Days Before Sale, House Being Sold	0.676***		0.531***
	(15.61)		(9.72)
Job Value of Completed Renovation, 180 Days Before Sale, House Being Sold		0.629***	0.414***
		(4.94)	(4.53)
Missing Job Value Amount 180 Days Before Sale			0.121**
			(2.40)
Job Value of Completed Renovations × Missing Job Value Amount, 180 Days Before Sale			-0.000265
			(-0.00)
Zip Median HP of Sold Home at Purchase	X	X	X
Five Interacted Property Sold Characteristic FE	X	X	X
Years Lived in Sold Home FE	X	X	X
Sale Zip × Transaction Year FE	X	X	X
Purchase Zip × Transaction Year FE	X	X	X
Observations	2,911,155	2,911,155	2,911,155
Adj. R^2	0.508	0.508	0.508

Table A.4
High Equity Gain Households Not Purchasing Recently Renovated Properties

This table reports results from estimating specifications similar to that of Equation 6 and to column (2) of Table 3. The dependent variables are various measures of recently completed renovations on the purchased property. The absence of an effect indicates that high equity gain households are not more likely to purchase recently renovated properties (and as such provides further evidence that renovations are not driving our causal estimates of the effect of equity gain on price premia). Results relate to the full sample of matched household moves. All dollar amounts are in $100,000 units. Controls and fixed effects are included as indicated. The Kleibergen-Paap rk Wald F statistic is reported for all 2SLS specifications. *t*-statistics in parentheses are heteroskedasticity-robust and clustered at both the purchase county and transaction year levels. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Renovation Completed 180 Days Before Purchase	Job Value of Completed Renovation 180 Days Before Purchase
	2SLS	2SLS
	(1)	(2)
Equity Gain, House Being Sold	0.000886 (0.64)	-0.000729 (-1.25)
Zip Median HP of Sold Home at Purchase	X	X
Five Interacted Property Sold Characteristic FE	X	X
Years Lived in Sold Home FE	X	X
Sale Zip × Transaction Year FE	X	X
Purchase Zip × Transaction Year FE	X	X
Instrumental Variable	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period
Observations	2,911,155	2,911,155
Weak ID KP *F* Stat	226.5	226.5

Table A.5

Price Premium Variation in the Time Series

This table reports results from estimating specifications similar to that of Equation 6 and to column (2) of Table 3. To examine how the effect of equity gain varies over time, we interact equity gain with indicators for various time periods chosen to roughly correspond with different housing market cycles (indicators for transactions in the years 1996–1999, 2000–2006, 2007–2009, 2010–2011, and 2020–2021, respectively, with the left out period of 2012-2019). We instrument for equity gain using the change in zip median house prices over the holding period, and instrument for these interactions using the change in zip median house prices multiplied by the time period indicator. All dollar amounts are in $100,000 units. Controls and fixed effects are included as indicated. The Kleibergen-Paap rk Wald F statistic is reported for all 2SLS specifications. Reported t-statistics in parentheses are heteroskedasticity-robust and clustered at both the purchase county and transaction year levels. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Price Premium, House Being Purchased
	2SLS
	(1)
Equity Gain, House Being Sold	0.0610***
	(4.19)
Indicator, 1996-1999 × Equity Gain	0.0955***
	(2.98)
Indicator, 2000-2006 × Equity Gain	-0.00370
	(-0.72)
Indicator, 2007-2009 × Equity Gain	0.0122***
	(3.00)
Indicator, 2010-2011 × Equity Gain	-0.00341
	(-0.52)
Indicator, 2020-2021 × Equity Gain	-0.0107***
	(-4.15)
Recent Renovation Controls, House Being Purchased	X
Zip Median HP of Sold Home at Purchase	X
Five Interacted Property Sold Characteristic FE	X
Years Lived in Sold Home FE	X
Sale Zip × Transaction Year FE	X
Purchase Zip × Transaction Year FE	X
Instrumental Variables	Zip ΔHPI over Sold Home Holding Period and Interactions
Observations	2,911,155
Weak ID KP F Stat	37.49

Table A.6

Equity Gains and Cash Discounts

This table reports results exploring the relationship between equity gain and cash purchase on price premia. In column (1) equity gains exhibit no causal relationship on whether or not a household purchases their next house all with cash. Consistent with the literature, we find a negative and significant relationship between a cash purchase and the purchase price of the home in column (4). Similarly, a cash purchase is associated with a decrease in price premia in columns (2) and (3). Price premia for cash purchases is significantly less sensitive to equity gain in column (3), whilst total transaction price is more so in column (4). The Kleibergen-Paap rk Wald F statistic is reported for all 2SLS specifications. Reported *t*-statistics in parentheses are heteroskedasticity-robust and clustered at both the purchase county and transaction year level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Cash Purchase, House Being Purchased	Price Premium, House Being Purchased	Price Premium, House Being Purchased	Log Transaction Price, House Being Purchased
	2SLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)
Equity Gain, House Being Sold	-0.00617	0.0594***	0.0619***	0.188***
	(-1.11)	(4.48)	(4.55)	(15.82)
Cash Purchase Indicator, House Being Purchased		-0.139***	-0.129***	-0.283***
		(-20.54)	(-23.15)	(-24.06)
Cash Purchase Indicator × Equity Gain			-0.00922***	0.0148***
			(-2.91)	(6.05)
Recent Renovation Controls, House Being Purchased	X	X	X	X
Zip Median HP of Sold Home at Purchase	X	X	X	X
Five Interacted Property Sold Characteristic FE	X	X	X	X
Years Lived in Sold Home FE	X	X	X	X
Sale Zip × Transaction Year FE	X	X	X	X
Purchase Zip × Transaction Year FE	X	X	X	X
Instrumental Variable(s)	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period	Zip ΔHPI over Sold Home Holding Period and Interaction	Zip ΔHPI over Sold Home Holding Period and Interaction
Observations	2,911,155	2,911,155	2,911,155	2,911,155
Weak ID KP *F* Stat	226.5	228.0	114.7	114.7

Table A.7
Spillovers Decreasing in Information

This table combines the specification of Table 7 column 1 with the interaction specifications of Table 6. Columns (1) and (2) report results relating to the sub-set of matched household moves where both the sold and purchased properties are in the same county ("local moves"). Columns (3) through (5) report results relating to the full sample of matched household moves, further restricted to observations with valid measurements of historical transaction volume, and standard deviations of price premia and transaction prices, respectively. All columns are subject to there being at least one subsequent transaction in the time period and geography relevant to the respective column. All dollar amounts are in $100,000 units. Standard deviations measures are divided by 100. Controls and fixed effects are included as indicated, with "at matched distance" referring to the geography relevant to the respective column. The Kleibergen-Paap rk Wald F statistic is reported for all 2SLS specifications. Reported t-statistics in parentheses are heteroskedasticity-robust and clustered at both the purchase county and transaction year levels. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Average Sales Price, within 1/2-Mile and 0-180 Days of Home Purchase				
	2SLS	2SLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)	(5)
Equity Gain, House Being Sold	0.173***	0.167***	0.0935***	0.0767**	0.0663**
	(3.10)	(2.98)	(3.27)	(2.38)	(2.15)
Years Lived in Sold Home × Equity Gain	-0.00341***				
	(-3.19)				
Above Median Years Lived in Sold Home (Ind.) × Equity Gain		-0.0378**			
		(-2.36)			
Historical Transaction Volume in Purchase Area, 1/2-Mile, 0-90 Days			-0.00112***		
			(-5.07)		
Historical Transaction Volume × Equity Gain			-0.000152***		
			(-2.89)		
Historical Price Premium St. Dev. in Purchase Area, 1/2-Mile, 0-90 Days				0.0000525***	
				(7.60)	
Historical Price Premium St. Dev. × Equity Gain				0.00000324	
				(0.88)	
Historical Price St. Dev. in Purchase Area, 1/2-Mile, 0-90 Days					-0.0000571***
					(-15.09)
Historical Price St. Dev. × Equity Gain					0.00000414***
					(2.85)
Four Quarterly Historical Average Prices, At Matched Distance	X	X	X	X	X
Zip Median HP of Sold Home at Purchase	X	X	X	X	X
Five Interacted Property Sold Characteristic FE	X	X	X	X	X
Years Lived in Sold Home FE	X	X	X	X	X
Sale Zip × Transaction Year FE	X	X	X	X	X
Purchase Zip × Transaction Year FE	X	X	X	X	X
Instrumental Variables	Zip ΔHPI over Sold Home Holding Period and Interaction	Zip ΔHPI over Sold Home Holding Period and Interaction	Zip ΔHPI over Sold Home Holding Period and Interaction	Zip ΔHPI over Sold Home Holding Period and Interaction	Zip ΔHPI over Sold Home Holding Period and Interaction
Sample	Local Moves	Local Moves	Full	Full	Full
Observations	1,215,360	1,215,360	2,596,487	2,448,822	2,539,603
Weak ID KP F Stat	52.26	52.88	108.7	98.97	104.5

Table A.8

CZ Level Equity Inflows Reduce Time-on-the-market

This table reports results related to estimations of specification similar to that of Equation 8. The left-hand side variable is a measure of the median (column (1)) or mean (column (2)) time on market for property listings in the commuting zone. The key right-hand variable of interest is the estimated total positive housing equity gain of in-migrants per local household $eg_{i,t}^{\text{non-local}}$ (as calculated in Equation 9). We instrument the equity gain inflow using $\widetilde{eg}_{i,t}^{\text{non-local}}$ as constructed in equation 10, using data only for movers coming from outside a 50 mile radius around the commuting zone. The Kleibergen-Paap rk Wald F statistic is reported for all 2SLS specifications. Controls and fixed effects are included as indicated. Reported t-statistics in parentheses are heteroskedasticity-robust and clustered at both the CZ and transaction year levels. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Median TOM in CZ	Mean TOM in CZ
	2SLS	2SLS
	(1)	(2)
Predicted Log Out-of-CZ Equity Inflow, Per Capita	-3.272**	-3.951**
	(-5.31)	(-4.78)
Year FE	X	X
Instrumental Variable	Log Exp. Out-of-CZ Equity Inflow, Per Capita	Log Exp. Out-of-CZ Equity Inflow, Per Capita
Observations	687	687
Weak ID KP *F* Stat	424.0	424.0