Cash to Spend: Credit Constraints, IPO Lockups, and House Prices

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February 2018

Abstract

Using Zillow ZTRAXX transaction data from California, we look at the impact initial public offerings (IPOs) have on local property values. With IPOs from 1993 through 2017 and using a quasi-experimental hedonic design, we compare the different events associated with going public: the public filing, the issuing, and the lockup events. From the results, there is evidence of increases in local house prices following each of these events where the treatment differs across IPO events, by property market segment, by firm and IPO characteristics, and is sensitive to the performance of the IPO. There is a baseline 4% increase in property values following the filing and issuing events that is found within 90 days and within 1 mile of the IPO firm's headquarters. For firms that do not have a lockup period the price change after the issuing date is over 7%. Around the lockup date, the subset of firms with the highest stock returns or volatility exhibit the highest price changes that are positive and significant to 10 miles from the firm. This study sheds light on the impact IPOs have on local housing markets where the IPO stages are a natural experiment to contrast changing expectations, wealth, and liquidity shocks. The evidence is consistent with constrained borrowers responding to changes in their demand for housing with the IPO events triggering tenure decisions.

JEL Classifications: ...
Keywords: Initial Public Offering; Property Value; Hedonic; ....

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1 Introduction

Insiders[1] are rewarded in an initial public offering (IPO). For example, PrivCo reported that twitter's IPO created 1,600 millionaires.[2] However, Twitter's insiders may have been millionaires prior to the IPO but held pre-IPO shares that were illiquid and were not priced on a public exchange. If insiders are able to smooth their consumption and there is not an unexpected shock from the IPO there should not be any changes in the consumption and tenure choices of insiders around an IPO. This follows directly from Friedman (1957) and the permanent income hypothesis (PIH), which says insiders should optimally smooth their consumption resulting from the IPO over time. Only unexpected wealth shocks or imperfect markets where insiders are subjected to liquidity and wealth constraints will lead to changes in consumption and tenure choices around an IPO. We compare and contrast the unique treatment characteristics of the events associated with going public or the public filing, the issuing, and the lockup events from the perspective of the mortgage and housing markets where underwriting guidelines and down payment requirements are binding constraints.

The events associated with going public are sequential, have well defined event dates, and uniformly apply treatment to insiders across firms. They effectively decompose the payoff from an IPO into updated expectations at the filing event, an unexpected wealth shock at the IPO issuing event, and changing liquidity restrictions around the lockup event. These different treatment effects are likely to have the largest impact in housing where the impact of binding constraints are well documented and distort property values (For examples of models showing the distortions in tenure choice models from binding constraints see Artle and Varaiya (1978), Schwab (1982), Slemrod (1982), Henderson and Ioannides (1983), and Brueckner (1986)). Therefore, the setting of IPO events and local house prices provide a perfect natural experiment.

The questions are twofold. First, do IPOs influence local house prices? This question expands on anecdotal reports of IPOs from individual firms indirectly effecting local housing markets.[3] Second, the sequential stages of IPOs[4] provide a unique setting for decomposing a wealth shock to local housing market participants as changes in expectation, wealth, and liquidity given credit constraints in housing.

The four stages for going public (pre-IPO filing, post-filing and pre-IPO issuance, post-IPO and

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[1]Insiders include pre-IPO shareholders that are often the founders, angel investors, venture capitalists, and key employees.

[2]PrivCo does market research of private firms and reported on twitter's IPO: http://www.privco.com/the-twitter-mafia-and-yesterdays-big-irs-payday

[3]"With Snap's I.P.O., Los Angeles Prepares to Embrace New Tech Millionaires" https://www.nytimes.com/2017/02/20/technology/snap-ipo-los-angeles-real-estate.html; "Millionaire's Row: How Did Facebook's IPO Affect Silicon Valley Real Estate?" https://www.zillow.com/blog/millionaires-row-how-did-facebooks-ipo-affect-silicon-valley-real-estate-86027/

[4]IPO filed, IPO issued, and the lockup.

pre-lockup, and post-lockup) are well-defined with explicit transition event dates and unique treatment characteristics. Prior to the firm publicizing their intent to go public: the exit strategy is uncertain[5]; the timing is uncertain; the market value of the firm is uncertain; and pre-IPO equity is non-fungible or costly to liquidate. When management decides to take the firm public they file Form S-1[6] with the SEC that publicizes their intention of pursuing an IPO, at which point insiders update their expectations.[7] Subsequently, the firm issues a combination of primary and secondary shares on a public exchange revealing the firm's market value but until the lockup period expires restricted shares cannot be sold. The lockup period gives investors confidence, acts as a signal of the firm's quality, keeps incentives aligned, reduces information asymmetries, and benefits underwriters' price support by restricting the supply of shares (Brav and Gompers (2003) and Arthurs et al. (2009)).

Underwriting standards in mortgage lending and credit constraints in home purchasing are explicit and uniformly applied. For example, the down payment constraint also known as loan-to-value (LTV) thresholds limit the amount of a property's sales price that a borrower can finance and impose additional costs for higher LTV loans.[8] The debt-to-income (DTI) restrictions limits the amount of outstanding debt that a borrower can have in proportion to their income.

These credit constraints are most likely to effect insiders. First, they lead insiders to forego housing consumption today. This is driven by both LTV and DTI considerations. In terms of the LTV, insiders are restricted in their ability to use pre-IPO shares and firm equity for the down payment. In terms of the DTI, insiders are receiving a greater proportion of their compensation in the form of stock options and equity because these firms are disproportionately cash constrained. When stock options take the place of real wages it lowers the amount of house that insiders can purchase as a function of their income. Second, they increase the likelihood that insiders use stock options and firm equity as a mechanism to save for a down payment. By saving less of their income insiders are able to consume more today and smooth their income. Therefore, IPOs trigger tenure decisions.

Also, unexpected increases in wealth resulting from the IPO may lead to a shift in the demand for housing consumption. Because housing, is non-divisible and it is both an asset and a consumption good the investment in owner-occupied housing is bounded by housing consumption. Therefore, consumers are not able to invest less in housing than they consume in housing services so changes in the demand for housing services necessarily require increases in its investment.[9] In addition, housing may be viewed

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[5]Other exit strategies such as a buyout are not considered.

[6]Pursuant to the Securities Act of 1933, Form S-1 registers the securities being offered in an IPO.

[7]The Jumpstart Our Business Startups (JOBs) Act was enacted April 5th, 2012 gives emerging growth companies the ability to file registration materials confidentially.

[8]For example, loans with an LTV in excess of 80% are charged private mortgage insurance (PMI). Private mortgage insurance (PMI) is added to the monthly mortgage payment as a percentage of the loan amount

[9]Brueckner (1997)

as a diversifying investment.

If the expected payoff matches the realized payoff from the IPO and if none of these constraints are binding then we should find no association between property values and IPOs. If there is evidence of a post-treatment effect around IPO events then we reject the null hypothesis in favor of the alternative hypothesis that either there are binding credit constraints or there is an unexpected wealth shock. Therefore, it is primarily an empirical question where the different IPO event windows effectively segment insiders by their expectations and binding constraints.

In this paper, we combine IPO and residential property transaction data for California from 1993 through 2017 and: (1) test for an association between IPOs and local house prices; (2) compare and contrast the different IPO events; (3) test for an association between IPOs and changes in the composition of residential properties being transacted by looking at porperty characteristics and market segment; and (4) test for an association between firm characteristics that includes IPO performance and house prices.

Following past event studies that look at exogenous shocks to local housing markets, we implement a quasi-experimental hedonic design. It is a spatial difference-in-differences approach that exploits proximity in space and discontinuity in time to identify the treatment group as transactions closer to the firm's headquarters occurring in the post-period of an IPO event. In this way, the price change from the pre-period to the post-period of transactions close to the firm versus those farther away is most likely to identify the change in property values caused by the IPO event.

From the results, there is evidence of a treatment effect between local house price changes and firms going public but the treatment effect is heterogeneous across IPO event types, firm characteristics, and the performance of the IPO. First, there are differences in treatment effects by IPO event. Around the IPO filing and issuing events there is a baseline positive and significant change in property values of around 4% within a mile of the firm. Without conditioning by firm characteristics and performance of the IPO there is no evidence of treatment associated with the lockup event.

Second, there is insufficient evidence of a change in the local property market. The types of properties and composition of property characteristics of transacted properties is not significantly different in the pre-period compared to the post-period across IPO events. There is some evidence that some market segments are more effected than others but the results are not consistent across IPO events. Also, the results around the filing event are slightly stronger for Silicon Valley at 4.5% but are otherwise insignificantly different from looking at California as a whole.

Third, the treatment effect varies by firm and IPO characteristics. The magnitude of treatment at issuance is 161% larger (at 1 mile) for the subset of firms without a lockup period compared to those

that do. Whereas the presence of secondary shares is insignificantly different from zero. Younger firms exhibit consistently larger price changes across IPO events that persists to 10 miles from the firm. For example, there is a 4.3% increase in property values around the lockup event for the youngest quartile of firms. Also, the quartile of largest firms by total assets prior to the IPO is associated with a positive and significant price change around the filing event but is not significant at the issuing and lockup events.

Fourth, we measure IPO performance as the stock price return over the offer price and its volatility. According to the the top quartiles of firms by return and volatility there is a positive and significant change in local house prices that persists to 10 miles from the firm. This result is consistent with risk-averse insiders diversifying into housing.

The evidence supports the three non-mutually exclusive hypotheses for how IPOs impact local property values. It is consistent with an *expectations hypothesis* where insiders that are not liquidity constrained respond to changes for their demand for housing consumption around the IPO filing event. There is evidence to support the *wealth hypothesis* or a positive change in property values when the IPO is issued and at the lockup event where the magnitude of treatment depends on the success of the IPO. Finally, there is evidence supporting the *liquidity hypothesis* with a positive change following the expiration of the lockup restriction but that depends on firm characteristics and the performance of the IPO. The stronger treatment found around the issuing date when no lockup period is present is evidence in support of the *liquidity hypothesis* as well. In general, IPO events are associated with price changes to local property markets. The hypotheses and supporting evidence are consistent with there being credit constraints in housing where there are some insiders on whom these constraints are binding.

This paper contributes to the literature in two ways. First, the IPO setting provides evidence on the relationship between decisions at the firm and local house prices. Our focus is on whether the firm's decision to go public is a trigger for increased demand for housing consumption in the local property market. Secondly, the different IPO events provide a unique setting for comparing and contrasting wealth and liquidity constraints by effectively segmenting participants in the housing market by the basket of constraints that are binding.

The paper is structured as follows. Section 2 provides institutional background and sets up the hypotheses. There is a discussion about the data and methods in section 3, which includes summary statistics. The main results are presented in section 4. In section 5 the treatment is decomposed by market segment, firm characteristics, and IPO performance. Finally, there is a concluding section.

2 Background and Hypothesis Development

There are three distinct but not mutually exclusive hypotheses about the mechanism where a firm going public impacts local property values. These are the *expectations, wealth,* and *liquidity* hypotheses, which directly follow from the sequential events of a completed IPO.

First, a firm declares their intent to go public. The firm is signaling that their IPO is imminent and removing uncertainty about the exit strategy for insiders. The U.S. Securities and Exchange Commission (SEC) requires that public offerings be registered prior to being listed on an exchange. Using the date when Form S-1 is submitted as the IPO filing event, we define the *expectations hypothesis* as a change in the demand for housing from an updated expectation about future wealth shocks.

On the one hand, the change in expectation could increase the demand for housing or it could fall as those that would have otherwise purchased now holdout for the IPO. If insiders consider the present value of the payoff from the IPO as the discounted sum of the probability that the firm IPOs in each period than filing increases the present value of the payoff by significantly reducing the number of discounted periods. Alternatively, there could be a drop in the demand for housing as market participants holdout until the IPO similar to Ashenfelter's Dip.[10] In this case, treatment is the payoff from the IPO and prior to treatment the treated group opts out of participating in the local housing market leading to a dip in property values. This dip only occurs, though, if credit constraints to acquire financing are binding so the ability of insiders to consume their desired level of housing services is restricted.

H1: *(Expectations Hypothesis)* There is a change in local property values following the submission of Form S-1.

Second, at the IPO event the firm issues equity and they are listed on an exchange. At this point, the uncertainty associated with the market value of the firm is removed as well as any uncertainty about whether the firm would successfully IPO. At this point, any wealth shock associated with the IPO is realized. There are two possible reasons for a change in local house prices around the IPO event. First, if the size of the wealth shock differs significantly from expectations then this unexpected change impacts the consumption and tenure choice of insiders in the post-IPO period (Friedman (1957)). Second, if there were binding constraints in the pre-IPO period that no longer bind. However, insiders wages are unlikely to change around the IPO event and their lockup restricted shares cannot be sold for a down payment. Therefore, there is not a significant change in an insiders debt to income ratio, which measures a borrowers ability to make monthly payments according to their income, or loan to value ratio, which measures the size of the down payment as a proportion of the property's value. Under

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[10]Ashenfelter (1978) identified pre-treatment wage trends in employment and training programs.

the *wealth hypothesis* changes in property values around the IPO event are due to changes in wealth of unconstrained insiders that lead to changes in the demand for housing.

H2: *(Wealth Hypothesis)* There is a change in local property values after the firm's shares are listed on a public exchange.

However, insiders may be liquidity constrained because of the lockup period. During this period, which is usually 180 days between the IPO and the expiration of the lockup, insiders are restricted from selling and cashing-out their shares. In some cases, there are IPOs that do not have a lockup period but that is not the norm. There are benefits to insiders of having a lockup period as it signals quality to investors, aligns incentives, and protects underwriters.

Firms can offer existing "secondary shares" at the IPO from insiders to the public in addition to new "primary shares". In this case, the lockup restriction does not apply to this subset of insiders. In Chua and Nasser (2016) does find that insiders are motivated to offer secondary shares by apparent liquidity needs. For example, smaller cash-pay is associated with larger secondary offerings. However, secondary shares are viewed negatively by investors and Aggarwal et al. (2002) demonstrate that it is optimal for managers to wait for the end of the lockup. In addition, only a small proportion of insiders may have this option versus employees with pre-IPO shares that are unlikely to have this opportunity. Therefore, the majority of firms and pre-IPO shareholders do not offer secondary shares (Field and Hanka (2001)).

Third, at the lockup event restricted shares are no longer restricted. To restricted shareholders the only difference between immediately before and immediately after the lockup is their ability to liquidate their restricted shares. The wealth associated with the payoff from the IPO does not change. Under the *liquidity hypothesis* there is a change in the demand for owner-occupied housing after lockup restrictions expire because insiders are no longer subjected to binding credit constraints.

H3: *(Liquidity Hypothesis)* Higher property values follow the expiration of the lockup period.

It is assumed that the value stored in the restricted shares is difficult or costly to access. There is also a concern that the accessibility of the restricted shares is not the only difference pre-post lockup. For example, Field and Hanka (2001) find an abnormal three-day return of -1.5% from looking at the returns around lockup events. However, evidence of a confounding abnormal negative return around the lockup only biases against finding evidence supporting the *liquidity hypothesis*.

The lockup period works in coordination with the down payment requirement. Artle and Varaiya (1978) show how down payments deter home ownership when the benefits from ownership do not exceed

the loss in utility from having to save. Pre-IPO shares provide a mechanism for insiders to save for the down payment. Also, when savings are sufficient the down payment restriction acts as a trigger event so that individuals purchase homes as soon as they reach the down payment threshold. Therefore, we expect tenure choice decisions to be made in coordination with IPO events. However, constrained shareholders are unable to respond to changes in their demand for housing consumption until the lockup expires, which then acts as a trigger event. The question about the magnitude and significance of this impact on local housing markets is an empirical one.

3 Methodology and Data

We follow a hedonic approach for modeling house prices to test for an association between IPOs and local house price changes. Rosen (1974) is credited with developing the hedonic price method that assumes property values can be regarded as the sum of implicit prices of a bundle of attributes in equilibrium. It is a common method applied in housing related research.

However, there is an omitted variable concern when prices and implicit goods are determined in a spatial equilibrium. In this case, if the choice of the firm's location correlates with the timing of the IPO; if the timing of the IPO correlates with local housing market cycles; or they both correlate with an unobserved omitted variable than the estimates for treatment will be biased.

To deal with this problem, we exploit spatial-temporal variation of IPOs. The approach is similar to Pope and Pope (2015) that looks at Walmart openings and compares transactions that are closer to the Walmart to those slightly farther away before and after it opens. Other studies with similar designs have looked at the impacts of sex offenders (Pope (2008)), the spillover effects associated with foreclosures (Gerardi et al. (2015), Lin et al. (2009), Schuetz et al. (2008)), and forced sales (Campbell et al. (2011)).

In the case of IPOs this difference-in-differences approach requires two assumptions for a causal interpretation of the results. First, insiders are assumed to want to live closer to the IPO firm's headquarters. As long as they place some value on the time they spend commuting and there is an association between distance and commuting time this should hold. Second, we attribute changes in house prices before and after an IPO event to the IPO event itself. By only including transactions that occur around the IPO event date being considered and within 5 miles of the firm's headquarters removes confounding events. This approach controls for house price trends and time invariant omitted variables.

The main concern is that the timing of an IPO is a choice variable that is endogenous. In Brau and

Fawcett (2006) from surveying chief financial officers (CFOs), the authors find that creating shares for acquisitions is the most important motivating factor for going public and the overall stock market and industry performance are the largest determinants of IPO timing. Therefore, we are not worried that IPO are timed or follow house prices directly but the motivations and determinants of IPO timing may still correlate with an omitted variable that correlates with local property values.

However, the IPO events being considered do not immediately follow the decision to go public. For example, the length of time between IPO filing and the expiration of the lockup period can span years. First, the period following the filing event can vary according to the length of time that managers spend on the road show gauging investor interest. Second, the variable filing period is followed by a well-defined lockup period that is generally 180 days, which is defined by institutional convention and not from any consideration of local house prices. There is no indication that IPOs are timed with the local housing cycle over the course of the IPO events. Therefore, it is assumed that IPO events are exogenous shocks to the local housing market.

3.1 Data and Summary Statistics

Transaction Level Data

We use Zillow residential property level data for California. It is a combination of Zillow transaction and property assessment files with transactions as far back as 1900 but with 99% of the sample falling between 1993 and 2017. This population of transactions is cleaned on missing and unwanted or unreasonable property characteristics. For example, intra-family transactions are excluded. Also, properties are filtered by property type, the number of parcels, and the number of buildings.[11] The final sample consists of properties that: have at least one full bathroom and at least one bedroom, non-negative property age and less than or equal to 150 years old, non-missing sales price greater than or equal to $1,000, not more than four units, non-missing latitude and longitude, land size strictly greater than 500 square feet, and non-missing number of stories less than or equal to three. The final sample has around 6.5 million unique property transactions spanning 1993 to 2017.

Initial Public Offering (IPO) Data

From SDC we obtain 1,987 unique IPOs for California from 1970 through 2017. This list of IPOs is filtered for missing address information, P.O. Boxes listed as the firm's address, and when google maps

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[11]Restricted to single parcel transactions with only one building. The included property types: residential general, single family or inferred single family, rural residence, townhouse, row house, planned unit development, and bungalow.

geocoding API returns a less than to the street address level accurate longitude and latitude. In the final sample there are 725 unique IPOs with at least one IPO event between 1993 and 2017.

The IPO data from SDC is supplemented with information from CRSP and Ritter's website.[12] From CRSP, we obtain the daily open and closing stock prices, returns with and without dividends, the number of shares outstanding, and the volume of shares traded. Whereas Ritter provides the firm's founding year and rollup status.[13] From the 725 unique IPOs: there are 224 firms that offer secondary shares at the IPO; 447 that are identified as being backed by venture capital; 71 where the IPO issue is backed by private equity; and 16 identified as being rollup firms.

Summary Statistics

Table 1 summarizes the distribution of transactions and IPOs by year and by IPO event. The IPO events are distributed across the sample period with some appearing in every year. However, the IPOs do come in waves with the most filings in 1999 at the peak of the dot-com bubble with a smaller wave around 2004 and then again around 2014. Therefore, the sample period covers a number of cycles and market environments including the financial crisis period.

Descriptive statistics are provided in table 2 at the property and firm level. Panel A summarizes the transacted properties where the average sales price over this period is $335,145. After adjusting these raw prices for inflation the average adjusted sales price over this period is $415,363.[14] The results are based on this adjusted sales price measure.[15] There is variation in the sample of properties appearing in the sample but the averages and standard deviations or 3.24 bedrooms, 2.00 full bathrooms, 1.32 stories, and around 29 years old are within expectations.

The average target price is $12.99 with a max of $97.00 where the proceeds from the IPO amounts to roughly $131 million. There is more variation at the IPO level as shown in panel B, which includes firms of all sizes. Across the IPO and firm level characteristics the standard deviations tend to be large. For example, the average for total assets is $224.24 million where the minimum is $0.10 million and maximum of $7,190 million for the largest firm by total assets. Looking at the variation in house price changes associated with the variation in IPOs and firm level characteristics provides a means to test the competing mechanisms for how IPOs impact local house prices. There is significant variation in the proportion of shares that are offered as primary or secondary shares as well as in terms of shares that are subjected to the lockup restrictions.

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[12]Ritter data covering IPOs was downloaded (10/21/2017) from: https://site.warrington.ufl.edu/ritter/ipo-data/

[13]A rollup is a firm that grows by acquiring other firms.

[14]Sales prices are adjusted by finding the 05/2017 dollar equivalent according to the monthly Consumer Price Index (CPI) for All Urban Consumers: All Items from https://fred.stlouisfed.org/series/CPIAUCSL (downloaded 7/19/2017).

[15]The results are robust to different measures of sales price.

Panels C and D provide information about the performance of the IPO. The average return at 1 year from the IPO is 25.47% with a minimum return of -227.78% and a maximum of 740.83%. Here the return is an average of the returns across the IPOs and is calculated for each IPO as the percentage change from the offer price to the closing price on the date considered (i.e. 1 year following IPO). To quantify the risk associated with the IPO, relative volatility is calculated at the IPO level as the standard deviation of closing prices divided by the average of closing prices over the period.[16]

Identifying Treatment

The distance and performance windows vary but the methodology for identifying pre and post-treated observations is consistent. Property transactions are identified as in a pre or post event window if they are within a specified radius of a firm's headquarters (1, 5, or 10 miles) and within 90 or 180 days of that firm's IPO event. For example, for firm XYZ the properties that are transacted within ±90 days of XYZ's filing event date and are less than or equal to 1 mile are defined as falling in either the pre or post-period for XYZ's filing event. The issuing and lockup events are defined in this way as well. The pre-period is inclusive of the event date itself.

However, there is the possibility that a transaction will be included in the pre-period for one IPO and the post or treatment period for another for the same IPO event type. To ensure that we have a clean interpretation of treatment, we restrict the samples to those observations that are in one pre-period or post-period window per event type. For example, a transaction that appears in the pre-lockup period for XYZ and the post-lockup period for another IPO is excluded from the lockup window analysis. This restriction applies to transactions occurring in multiple pre-periods or post-periods as well. For example, if instead of occurring in a pre-lockup period and a post-lockup period for different IPOs an observation appears in multiple post-lockup periods then this observation is excluded. The event level descriptive statistics are based on this event window definition.

Event Level Statistics

Table 3 shows mean differences in the adjusted sales price of transactions a in a pre or a post-period by event type and across distances or 1, 5, and 10 miles. The post-filing prices are consistently higher than the corresponding pre-filing prices that represent a 3.7% increase in unconditional mean at 1 mile, which falls to a 2.8% and 1.3% increase at 5 miles and 10 miles respectively. The lockup event shows a consistent negative price change in local house prices across the distances with the largest decrease

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[16]For the property level analysis, the returns and relative volatility are calculated with the sale date defining the holding period.

or -6.5% at 1 mile around the firm. The change around the issue date varies from negative at 1 mile and 10 miles but positive at 5 miles. The largest magnitude for the price change around the issue date or -2.4% is found at 1 mile distance boundary from the firm. Therefore, the largest differences are consistently found at the most restrictive distance boundary of 1 mile.[17]

To control for differences in the composition of properties that are being transacted in the pre versus post-period by IPO event additional analysis is necessary.

4   Results

The analysis is run by IPO event at the property level. The base model gives the conditional average treatment effect on the treated where treatment is defined as the post-period of each IPO event.

4.1   Base Model

The base model specification is run for each IPO event where the sample of observations includes only those transacted properties within 1 mile of the IPO firm's headquarters and are in a pre or post-period window:

$$ln(P_{if}) \quad = \quad \beta_0 + \beta_1 Post_{if} + uX_i + \eta_f + \varepsilon_{if} \tag{1}$$

The dependent variable is the natural log of the sales price (P_{if}) for property i that falls in the IPO event window for IPO f. $Post_{if}$ identifies a transaction as occurring in the post-IPO event window. In this specification, the control group are transactions in the pre-IPO event window within 1 miles of the firm. In addition, equation 1 includes controls for property characteristics (X_i) and firm fixed effects (η_f), which are location and time specific. Because the IPOs are not simultaneous reduces the concern of confounding events. The firm fixed effects identify the geographic regions, pre-post treatment periods specific, and firm level variation across IPOs. The controls for property characteristics (X_i) capture the observable differences due to: land sf, total number of rooms, number of bedrooms, number of full bathrooms, number of half bathrooms, age, the number of stories, and property types.

Table 4 displays estimates from equation 1 by IPO event where standard errors are clustered at the firm level. The base model consistently captures the variation in house prices with adjusted r-squares between 0.61 and 0.63. In addition, the coefficient estimates for property characteristics are consistent

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[17]Table A1 in the appendix shows the full set of descriptive statistics for property characteristics by IPO event that appeared in Panel A of table 2 for a 1 mile distance boundary and 90 day performance window.

across the IPO events and have the expected signs. For example, the coefficient on log land area in square feet is positive and significant at the 1% level. In terms of treatment, the coefficient estimate for $Post_{if}$ indicates a roughly 3.9% increase in house prices following the IPO filing event and a 3.8% increase following the issue date where both are significant at the 1% level. However, for the lockup date the estimate is close to zero and insignificant. This implies a general increase in house prices within 1 mile and 90 days of the firm but only around the IPO filing and issuing dates. The results support the expectations and the wealth hypotheses.

4.2   Difference-in-Difference

The coefficient estimate of treatment from equation 1 represents an average treatment effect within 1 mile, which is reasonable if treatment is assumed to be uniform over the sample space. However, an IPO is more likely to impact prices for properties that are closer to the firm than those that are farther away. Therefore, we expect larger and more significant changes closer to the firm's headquarters. From the perspective of bid-rent theory from Alonso (1960), the value of proximity to the firm increases because the demand for proximity increases. Where the base model holds the IPO pre-post area constant and exploits the discontinuity in event time, this difference-in-difference specification exploits the assumption of an increasing implicit value for proximity. Therefore, it exploits both a discontinuity in time and heterogeneity in the treatment effect across space. To test for spatial variation in treatment, we add a proximity band at 0.25 miles and run the following difference-in-differences specification:

$$ln(P_{if}) \quad = \quad \beta_0 + \beta_1 Post_{if} + \beta_2 D_{if0,25} + \beta_4 (Post_{if} \cdot D_{if0,25}) \tag{2}$$
$$+ u X_i + \eta_f + \varepsilon_{if}$$

Here the indicator $(D_{if,0.25})$ flags transaction i if it is within 0.25 miles of firm f. In table 5 the coefficient estimates for the interaction of the treatment and proximity are positive. Although they are not statistically significant the evidence supports a spatial association of proximity and house prices changes. The main effect on treatment is similar to the results from the base model specification displayed in table 4. Given that the sample is bounded to be within 1 mile of the firm the observations in the post period are still treated.

From the base model and difference-in-difference specifications we fail to reject the alternative hypotheses that changing expectations around the filing event and wealth shocks around the issue date lead to changes in local house prices. Specifically, there is evidence of an increase in house prices within

1 mile and 90 days following the IPO filing and issuing events. There is no evidence of a binding liquidity constraint although there is a slightly positive change in house prices but it is not significant.

5   Secondary Results

The following tests are intended to decompose the treatment effect by housing market segment and firm characteristics with the goal of teasing out the mechanism driving the main results. Specifically, the questions are as follows: (1) Do IPO events identify a change in the types of properties that are being transacted and the demand for certain amenities in the local market? (2) Is the treatment effect associated with types of firms, for example, by the size or age of the firm? (3) Is the firm's stock performance following the IPO correlated with the direction and magnitude of the price changes in housing around the IPO events?

5.1   By Market Composition

There are two reasons to focus on the composition of the properties being transacted in the pre versus post period. First, from the perspective of the treatment effect as a change in house prices we want to validate that the price change is not a result of a change in the composition of transacted properties. If the composition of the market has changed then we may be attributing to a price change a change that is really due to changes on unobservables such as quality. Unfortunately, we do not have a measure of quality to test this hypothesis directly but if it correlates with an observable property characteristics than evidence of a change in the market would indicate this possibility. Secondly, the perspective so far has been that a change in house prices is the treatment effect of interest. However, if the market is fundamentally altered then that should be considered as part of the treatment effect associated with a firm going public. In this case, the treatment effect would be captured by controlling for observable property characteristics so it would not be evident as a change in price from the pre to the post-period. For example, if larger houses are purchased in the post period and the controls for number of rooms, bedrooms, and bathrooms absorbs this change then it would not appear as a change in local house prices. We estimate the following model specification to validate that the changes in house prices found above are not associated with changes in the composition of the housing market.

$$PropChar_{if} \quad = \quad \beta_0 + \beta_1 Post_{if} + \eta_f + \varepsilon_{if} \tag{3}$$

Equation 3 produces estimates of the treatment effect with the property characteristics, $PropChar_{ift}$, as the dependent variables. The set of the characteristics displayed include: ln(finished sf), stories, total rooms, number of bedrooms, number of full and half bathrooms, and age. Firm fixed effects are included to account for the spatial and temporal variation by IPO event and the errors are clustered at the firm level. From table 6, we reject the alternative hypothesis in favor of the null hypothesis that there is no change in the composition of properties transacted in the pre versus post period. There is insufficient evidence for a difference in the market by observable characteristics in the pre versus post-periods across IPO events.

5.2 By Market Segment

Another perspective is to look at different segments within the local housing market. Instead of looking at the average treatment effect on the treated, the question is whether the treatment effect is primarily found at the higher or lower end of the market; whether it is found above or below the conforming loan limit; and whether the treatment effects for Silicon Valley, which is often perceived to be a center of entrepreneurship, is consistent with greater California. We estimate the following model specification to identify differential treatment effects by market segment within and across IPOs.

$$
\begin{aligned}
ln(P_{ifc}) \quad = \quad & \beta_0 + \beta_1 Post_{if} + \beta_2 MktSeg_{ifc} + \beta_4(Post_{if} \cdot MktSeg_{ifc}) \\
& + uX_{ic} + \eta_f + \varepsilon_{ifc}
\end{aligned}
\tag{4}
$$

The first two columns of table 7 show the results from equation 4 where the market is segmented by property values or the median and 90th percentile defined at the county level from the prior quarter. For example, a transacted property is defined as being above the median sales price if it is strictly greater than the median sales price at the county level from the previous quarter. The indicator for the 90th percentile is defined similarly. In these first two columns the interaction term or treatment and market segment, $(Post_{if} \cdot MktSeg_{if})$, is the coefficient of interest. From the first column where the segments are defined according to median property values there is a negative estimate on the interaction term around the filing event that is significant at the 5% level but is insignificantly different from zero for the issue and lockup events. Therefore, there is evidence that the price appreciation associated with the treatment around the filing event is stronger for those properties below the median sales price.

Looking at the results at the 90th percentile of property values the coefficient estimate on the interaction term is negative for the issue and lockup events but positive around the filing date. It is

only statistically significant, though, around the issuing event with a 4.2% decline in house prices above the 90th percentile (at the 10% significance level). Therefore, the is not evidence that suggests the results are being driven by the right tail of the distribution of properties. Segmenting the market in this way shows the distribution of the treatment effect across properties by price but the cutoff at the median and 90th percentile is not a meaningful cutoff.

On the other hand, the conforming loan limit is important both in terms of credit availability and the cost of mortgage financing. In column three we segment by the general conforming loan limit. Specifically, the limit here is defined as the maximum allowable property value when the general conforming loan limit is 80% of the sales price. Given the additional costs associated with LTVs exceeding 80% this seems to be a reasonable and meaningful cutoff in mortgage financing. The focus in the third column is on the on the interaction of the conforming loan limit and treatment where the coefficient estimates across the IPO events is consistently negative. However, none are statistically significant.

Lastly, we focus on Silicon Valley in the final column.[18] Here the level captures the fact that Silicon Valley properties are generally more expensive and the interaction term gives the differential treatment around the IPO events associated with Silicon Valley IPOs. The coefficient estimates on the interaction term are not significant with the largest and only positive magnitude found around the filing event. By identifying Silicon Valley and the differential with treatment lowers the magnitude and significance of the post coefficient around the filing event.

Therefore, there is limited evidence for differential effects within markets by segment and across markets. For the most part the coefficient estimates on the interaction terms are insignificantly different from zero and we fail to reject the null hypothesis in most cases.

5.3 By IPO Offering Shares

The absence of a lockup window or the presence of secondary shares at issuance are negative signals to investors. In these cases, the insiders and pre-IPO shareholders are not subjected to the same set of restrictions around the issuing event allowing insiders to cash-out. To this point, no adjustments have been made to control for secondary shares offered at the IPO or for IPOs that do not have a lockup period. Out of the 725 unique IPOs in the sample there are 152 that do not have a lockup period and separately 224 where secondary shares are included in the IPO.

Using equation 1 from above, table 8 highlights treatment by the type of shares and restrictions

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[18]Silicon valley is defined as: all of Santa Clara and San Mateo Counties; Fremont, Neward, and Union City of Alameda County; Scotts Valley of Santa Cruz County; and San Francisco City and County. As of 2/3/2018 this follows from: http://siliconvalleyindicators.org/about/.

present around the issuing event. The presence of secondary shares is looked at separately so in the first column are only those IPOs where secondary shares are present versus the second column that shows only those IPOs where secondary shares were not present. Similarly, columns three and four show IPOs with a lockup restriction compared to those that did not have one. The results are conditioned on property characteristics including firm fixed effects with the standard errors clustered at the firm level. Also, the distance is varied from 1 mile to 5 and 10 miles showing the persistence of treatment.

First, the presence of secondary shares is more likely to identify liquidity needs of insiders (Chua and Nasser (2016)). Therefore, it is assumed that the treatment would be stronger for firms with secondary shares included at the IPO. However, there is no evidence to support this claim in fact the treatment associated with the subset of firms that are identified as offering secondary shares is not statistically significant at any distance and is consistently lower in magnitude than the subset of firms that do not include secondary shares with their IPO. Looking at the firms without secondary shares the coefficient estimate is stronger than the base case at 4.3% and statistically significant at 1% for 1 mile and 5 miles where the estimate is monotonically decreasing across the distances but is still significant at the 10% level at 10 miles from the firm. There is the possibility that firms where secondary shares are offered are fundamentally different and that the number of insiders offering secondary shares is limited that is leading to this null result.

Second, when there is no lockup restriction then insiders and pre-IPO shareholders are free to liquidate their holdings right after the IPO. Therefore, we expect a stronger treatment effect to be associated with those offerings that do not include a lockup restriction. According to table 8 column 4 the subset of firms without a lockup restriction exhibit a consistently higher treatment effect or 7.3% at 1 mile, which is nearly double the issue date base estimate of 3.9%. This result is consistent with the *liquidity hypothesis* that the lockup restriction is limiting but there is the possibility that firms that do not have lockup restrictions are different and the absence of a lockup restriction is a proxy for a set of firm characteristics driving the difference in treatment effects around the issue date.

5.4   By Firm Characteristics

A natural extension is to look at whether firm characteristics are correlated with the treatment effect. We focus on the approximate age of the firm, which is defined as the difference between the founding year and issue year, and the total assets of the firm prior to going public.[19] Firm age is a likely proxy for growth and time at the headquarters while total assets is a proxy of firm size. Because

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[19]Firm age is defined as the difference between the IPO issue year and the founding year from the Field-Ritter data set of company founding dates.

the relationship between firm age and total assets with local house prices is not predictable we sort the firms into buckets by quartiles and then run the base model separately by quartile.

For these results, the geographic bound is shifted from a focus at 1 mile from the firm to a 10 mile boundary because at 1 mile the treatment by quartiles tend to be significant regardless of the quartile order and at 10 miles the results highlight the persistence and magnitude of treatment. Controls are included for property characteristics and firm fixed effects with clustered errors at the firm level. Table 9 shows the coefficient estimates of treatment by firm age quartile by event and there is a consistent positive and statistically significant effect found for the youngest quartile of firms. Around the issue and the lockup dates only the youngest firms exhibit significant coefficient estimates for treatmet where they are significant at the 1% level with a 3.6% and 4.3% change in local house prices respectively. Around the filed date the youngest and oldest quartile of firms are both positive and significant at the 5%. Therefore, firm age does capture an association between the firm, IPO event, and the associated change in house prices.

Table 10 gives the estimates of treatment by total asset quartile. Only the largest quartile by total assets is positive and significant around the filing event at 10 miles. Otherwise, the estimates of treatment are insignificantly different from zero and there is not evidence to support a hypothesis that firm size is correlated with changes in local house prices around the issue and lockup events. There are other ways to consider the performance of the firm and treatment.

5.5   By IPO Performance

We consider two measures of IPO performance: the return and the risk. Unrestricted insiders should optimally allocate and diversify their portfolio of assets. Insiders are assumed to be risk-averse. If insiders are risk-averse then they should be more willing to sell their shares as the risk in holding the firm's equity increases. Studies on the early exercise of employee stock options (ESOs) find a positive correlation with volatility (Huddart and Lang (1996), Kulatilaka and Marcus (1994), and Huddart (1994)). Therefore, increased volatility and risk from holding the IPO firm's equity is predicted to be positively associated with local house price changes. Therefore, higher returns and higher volatility are expected to correlate positively with the magnitude of the price change in the local housing market.

To test for the role returns play on a buyer's willingness and ability to transact in the housing market, we define the return by the event date from the offer price. Specifically, it is the price change from the IPO offer price to the close of the event date being considered. As a result, we only consider the issuing and lockup event dates. At the issue date this measure of return identifies IPO underpricing.

Similar to the approach that was previously applied to the analysis of firm characteristics we sort the firms according to their returns over the offer price and bucket the IPOs into quartiles and run the base model specification by quartile.

Table 11 panel A shows results of equation 1 with the quartiles bucketed by returns. Within 10 miles there is a significant and positive association for the quartile with the largest return for both the issue and lockup events. At the issue date it represents a roughly 5.1% (at the 1% level) and a 2.3% (at the 5% level) increase in house prices between filing and lockup events respectively. Only the largest quartile has a significant treatment effect around the lockup date whereas the filing event also exhibits a positive and significant treatment at the lowest quartile of IPO returns. If returns proxy for the wealth effect of the firm going public then a positive association between returns and the change in house prices around both the issue and lockup events provides additional evidence in support of the *wealth hypothesis.* This result is consistent with a positive association between wealth and housing demand.

Relative volatility is defined to capture the volatility of firm f's stock from the IPO to the lockup as the ratio of the stock's movements to its average closing price. Specifically, it is defined as the coefficient of variation or the standard deviation, σ_f, of the closing prices divided by the mean of closing prices, μ_f, over the holding period. A higher ratio indicates larger variability in closing prices and vice versa. Table 11 panel B shows results from the base equation by quartile sorted by relative volatility. Within 10 miles there is a positive coefficient estimate of treatment or 2.3% increase in house prices following the lockup event for the highest quartile of IPOs by relative volatility and it is significant at the 1% level. The three other quartiles are insignificantly different from zero. The evidence is consistent with risk-averse insiders who are restricted by the lockup period diversifying their portfolios into housing after the lockup period expires.

In general, the evidence from returns and volatility supports an association between IPO performance and local house prices. However, there is no information available or controls for portfolio considerations. Therefore, there is insufficient information to assume that housing and holding the IPO firm's stock are complements or substitutes.

6   Conclusion

Looking at the association between IPOs and local house prices, we find that for IPOs in California there is a significant and positive increase in local house prices following a firms decision to go public and following the issue date. The evidence is consistent with insiders experiencing a positive shock to their demand for housing from their firm going public and those that are not liquidity or wealth constrained

responding to changes in their demand for housing following the filing event. Around the issue date there is a positive and significant treatment effect, which is even stronger for those firms without a lockup period and for firms with the highest returns over the offer price at the IPO. Alternatively, insiders that are liquidity constrained wait until the lockup expires but the treatment around the lockup is conditional on firm characteristics and IPO performance. Across IPO events there is significant variation in the treatment effect that is associated with proximity to the firm, market segment, type of offering shares, firm characteristics, and IPO performance.

This study highlights credit constraints in mortgage lending that bind for a segment of insiders and pre-IPO shareholders who are restricted from cashing-out from an IPO until the lockup period expires. These results are preliminary and so more studies are needed. This paper informs on how completed IPOs can impact local house prices. Where the IPO event itself provides a natural experiment to deconstruct an overall effect, in this case a wealth shock to insiders, into changes in expectation, wealth, and liquidity in the presence of mortgage lending constraints.

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Table 1. Property Transactions and IPO Events by Year

Year	Observations	Filed Date	Issue Date	Lockup Date
1993	65,877	50	53	32
1994	200,200	30	32	32
1995	182,591	66	56	34
1996	212,709	88	92	81
1997	240,619	53	49	55
1998	276,327	33	37	37
1999	288,666	96	83	24
2000	283,809	56	71	35
2001	266,668	6	11	23
2002	294,527	5	8	7
2003	318,125	12	6	3
2004	348,088	33	34	22
2005	346,806	11	12	26
2006	258,758	18	14	11
2007	213,637	13	20	19
2008	335,477	2	3	10
2009	328,327	6	4	1
2010	297,348	7	6	6
2011	287,641	12	10	9
2012	268,893	8	13	10
2013	233,346	22	17	13
2014	214,384	34	30	23
2015	231,224	16	19	21
2016	226,731	13	14	12
2017	161,022	11	17	18
Total	6,381,800	701	711	564

Displaying California IPOs and property transactions from the cleaned data sample.

Table 2. Descriptive Statistics

Variables	Mean	S.D.	Minimum	Maximum
Panel A: Property Transaction Level				
Sales Price	335,145	501,165	1,000	400,000,000
Sales Price*	415,363	610,106	1,005	487,142,528
Land (sf)	18,707	741,819	502	433,566,875
Total Rooms	5.06	3.38	0.00	99.00
Bed Rooms	3.24	0.87	1.00	20.00
Full Bathrooms	2.00	0.70	1.00	20.00
Half Bathrooms	0.26	0.44	0.00	11.00
Age	29.20	23.53	0.00	150.00
Stories	1.32	0.48	1.00	3.00
Observations	6,381,800			
Panel B: IPO Level				
Firm Age	11.60	16.86	0.00	158.00
Total Assets ($ mil)	224.95	733.18	0.10	7,190.00
IPO Offer Price	12.99	6.94	0.10	97.00
Proceeds Amount ($ mil)	131.11	640.86	0.04	16,006.88
Shares Outstanding After Offer	41,643,796	112,713,832	900,000	2,138,084,992
Secondary Shares of Shares Offered	3,647,752	17,049,468	3,395	241,233,616
Secondary Shares of Shares Offered (%)	9.40	19.45	0.00	100.00
Primary Shares of Shares Offered (%)	90.60	19.45	0.00	100.00
Secondary Shares Flag	224			
No Lockup	152			
Number of IPOs	725			
Panel C: IPO Returns (%) from Offer Price to Close of				
Issue Date	35.87	60.96	-23.07	525.00
Lockup Date	28.50	101.26	-260.42	1,140.00
IPO at 1 year	25.47	112.97	-227.78	740.83
Panel D: IPO Relative Volatility (%) from IPO to Close of				
Lockup Date	26.83	24.80	0.71	302.33
IPO at 1 year	36.64	27.50	5.12	319.13

Displaying California IPOs and property transactions from cleaned data sample. (*) are adjusted or current prices using the monthly CPI or Consumer Price Index for All Urban Consumers: All Items (to December 2017 prices). IPO returns (%) are calculated as the percentage change from the IPO offer price to the most recent closing price for the lockup date or the date of the IPO at 1 year. IPO relative volatility is the standard deviation of closing prices divided by the average of closing prices over the period.

Table 3. Sales Price by IPO Event

	Total		Pre		Post		T-Stat
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Diff.
Panel A: at 1 Mile and 90 Days							
Filed Date	629,279	563,366	617,520	528,570	640,645	594,880	2.71
Issue Date	646,357	740,927	654,034	828,953	638,329	635,938	-1.40
Lockup Date	668,347	912,462	690,948	1,089,577	645,953	693,064	-2.92
Panel B: at 5 Miles and 90 Days							
Filed Date	681,985	807,360	672,437	802,307	691,254	812,131	5.60
Issue Date	694,828	799,696	692,611	824,883	697,135	772,627	1.40
Lockup Date	706,437	814,693	708,142	795,428	704,718	833,664	-1.02
Panel C: at 10 Miles and 90 Days							
Filed Date	631,072	673,299	627,083	612,071	634,981	728,321	3.76
Issue Date	627,098	656,341	629,227	657,589	624,903	655,047	-2.20
Lockup Date	651,237	702,546	653,601	707,191	648,864	697,849	-2.22

Displaying California mean differences of sales price for property transactions in current (December 2017) dollars that are identified as falling in a pre or post IPO event window. The pre and post-periods include transactions within 90 days of the event date where the exact event date is included in the pre-period and transactions present in more than one pre-post window per event are excluded.

Table 4. Pre-Post at 1 mile

Dependent Variable: ln(Sales Price)	Filed Date	Issue Date	Lockup Date
Post Event Date	0.039***	0.038***	0.008
	(0.009)	(0.008)	(0.012)
Ln(Land SF)	0.156***	0.164***	0.185***
	(0.021)	(0.020)	(0.020)
Total Rooms	0.045***	0.055***	0.035**
	(0.010)	(0.006)	(0.015)
Bedrooms	0.008	0.008	0.005
	(0.012)	(0.009)	(0.019)
Full Bathrooms	0.121***	0.098***	0.126***
	(0.012)	(0.011)	(0.015)
Half Bathrooms	0.092***	0.095***	0.114***
	(0.014)	(0.014)	(0.016)
Age	-0.013***	-0.014***	-0.015***
	(0.002)	(0.002)	(0.003)
Age Squared	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
Age Cubed	-0.000**	-0.000***	-0.000**
	(0.000)	(0.000)	(0.000)
Age $\geq$ 50 Years	-0.006	-0.024	0.010
	(0.032)	(0.027)	(0.034)
Stories > 1 & < 2	0.030	0.016	0.076**
	(0.038)	(0.030)	(0.032)
2 Story	0.055***	0.047***	0.069***
	(0.018)	(0.016)	(0.019)
Stories > 2 & < 3	0.206**	0.080***	-0.048
	(0.105)	(0.023)	(0.301)
3 Story	0.088**	0.081**	0.110***
	(0.035)	(0.037)	(0.035)
2nd Home	0.016	0.054	-0.044
	(0.026)	(0.037)	(0.049)
PUD	0.061***	0.051***	0.061***
	(0.019)	(0.018)	(0.017)
Condominium	-0.060**	-0.055*	-0.053**
	(0.025)	(0.032)	(0.024)
Constant	10.648***	10.346***	9.594***
	(0.234)	(0.220)	(0.343)
Property Type FE	Y	Y	Y
Firm FE	Y	Y	Y
Adjusted R-Sqr	0.61	0.63	0.63
Observations	17,379	17,492	13,978
Number of IPOs	446	448	359

Displaying transaction level OLS estimates where the dependent variable is the natural log of sales price (December 2017 dollars). Displayed standard errors are clustered at the Firm level and the 1, 2, and 3 stars indicate statistical significance at 10%, 5%, and 1%, respectively. Transactions that are present in more than one IPO event per event are excluded.

Table 5. Bounded at 1 mile with a Band at 0.25 miles

Dependent Variable: ln(Sales Price)	Filed Date	Issue Date	Lockup Date
Post Event Date	0.037***	0.038***	0.008
	(0.009)	(0.008)	(0.012)
Distance < 0.25 miles	-0.089	-0.006	0.008
	(0.069)	(0.033)	(0.032)
Post*(Distance < 0.25 miles)	0.089	0.017	0.003
	(0.067)	(0.040)	(0.040)
Ln(Land SF)	0.156***	0.164***	0.185***
	(0.021)	(0.020)	(0.020)
Total Rooms	0.045***	0.055***	0.035**
	(0.010)	(0.006)	(0.015)
Bedrooms	0.008	0.008	0.005
	(0.012)	(0.009)	(0.019)
Full Bathrooms	0.121***	0.098***	0.126***
	(0.012)	(0.011)	(0.015)
Half Bathrooms	0.092***	0.095***	0.114***
	(0.014)	(0.014)	(0.016)
Age	-0.013***	-0.014***	-0.015***
	(0.002)	(0.002)	(0.003)
Age Squared	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
Age Cubed	-0.000**	-0.000***	-0.000**
	(0.000)	(0.000)	(0.000)
Age ≥ 50 Years	-0.006	-0.024	0.010
	(0.032)	(0.027)	(0.034)
Stories > 1 & < 2	0.031	0.016	0.076**
	(0.039)	(0.030)	(0.032)
2 Story	0.054***	0.048***	0.069***
	(0.018)	(0.016)	(0.019)
Stories > 2 & < 3	0.204*	0.080***	-0.048
	(0.105)	(0.023)	(0.301)
3 Story	0.088**	0.081**	0.110***
	(0.036)	(0.037)	(0.035)
2nd Home	0.016	0.054	-0.044
	(0.027)	(0.037)	(0.049)
PUD	0.061***	0.050***	0.061***
	(0.019)	(0.018)	(0.017)
Condominium	-0.059**	-0.055*	-0.053**
	(0.025)	(0.032)	(0.024)
Constant	10.666***	10.345***	9.592***
	(0.239)	(0.220)	(0.343)
Property Type FE	Y	Y	Y
Firm FE	Y	Y	Y
Adjusted R-Sqr	0.61	0.63	0.63
Observations	17,379	17,492	13,978
Number of IPOs	446	448	359

Displaying transaction level OLS estimates where the dependent variable is the natural log of sales price (December 2017 dollars). Displayed standard errors are clustered at the Firm level and the 1, 2, and 3 stars indicate statistical significance at 10%, 5%, and 1%, respectively. Transactions that are present in more than one IPO event per event are excluded.

Table 6. IPO Events and Property Characteristics at 1 mile

Dependent Variable:	Ln(Land SF)	Stories	Total Rooms	Bedrooms	Full Bathrooms	Half Bathrooms	Age
Panel A: Filed Date							
Post Event Date	-0.003	0.015	-0.028	-0.016	0.004	0.007	-0.488
	(0.018)	(0.013)	(0.037)	(0.018)	(0.012)	(0.009)	(0.378)
Constant	8.534***	1.468***	6.727***	3.250***	2.232***	0.265***	8.231***
	(0.010)	(0.007)	(0.021)	(0.010)	(0.007)	(0.005)	(0.216)
Firm FE	Y	Y	Y	Y	Y	Y	Y
Adjusted R-Sqr	0.28	0.22	0.31	0.18	0.16	0.13	0.48
Observations	17,379	17,379	17,379	17,379	17,379	17,379	17,379
Number of Firms	446	446	446	446	446	446	446
Panel B: Issue Date							
Post Event Date	-0.018	0.004	0.009	0.012	0.004	0.005	0.588
	(0.015)	(0.013)	(0.028)	(0.016)	(0.012)	(0.009)	(0.387)
Constant	8.512***	1.442***	6.545***	3.140***	2.170***	0.295***	8.616***
	(0.007)	(0.006)	(0.013)	(0.008)	(0.006)	(0.004)	(0.187)
Firm FE	Y	Y	Y	Y	Y	Y	Y
Adjusted R-Sqr	0.29	0.20	0.35	0.20	0.16	0.12	0.48
Observations	17,492	17,492	17,492	17,492	17,492	17,492	17,492
Number of Firms	448	448	448	448	448	448	448
Panel C: Lockup Date							
Post Event Date	0.001	-0.002	-0.061	-0.038*	-0.014	-0.014	0.563
	(0.017)	(0.011)	(0.038)	(0.021)	(0.012)	(0.009)	(0.471)
Constant	8.492***	1.395***	6.542***	3.165***	2.232***	0.190***	8.876***
	(0.008)	(0.005)	(0.017)	(0.009)	(0.005)	(0.004)	(0.215)
Firm FE	Y	Y	Y	Y	Y	Y	Y
Adjusted R-Sqr	0.31	0.26	0.30	0.21	0.17	0.15	0.48
Observations	13,978	13,978	13,978	13,978	13,978	13,978	13,978
Number of Firms	359	359	359	359	359	359	359

Displaying transaction level OLS estimates where the dependent variable is one of following property characteristics: ln(land sf), number of stories, total number of rooms, number of bedrooms, number of full bathrooms, number of half bathrooms, and age. The figures in parentheses are standard errors clustered at the firm level and the 1, 2, and 3 stars indicate statistical significance at 10%, 5%, and 1%, respectively. Observations that occur in more than one IPO event per event type are excluded as well as transactions beyond 1 mile from the firm's headquarters and outside the performance window.

Table 7. IPO Events and Market Segment at 1 mile

Dependent Variable: ln(Sales Price)	Median* (> Med)	90th Pct* (> 90%)	Conforming (> Limit/80%)	Silicon Valley (Inside)
Panel A: Filed Date				
Post Event Date	0.056***	0.043***	0.037**	0.020
	(0.015)	(0.009)	(0.016)	(0.018)
Mkt	0.599***	0.521***	0.600***	2.032***
	(0.021)	(0.028)	(0.025)	(0.191)
Post*Mkt	-0.039**	0.025	-0.027	0.025
	(0.016)	(0.023)	(0.018)	(0.021)
Constant	10.997***	11.213***	11.076***	10.664***
	(0.160)	(0.207)	(0.204)	(0.235)
Adjusted R-Sqr	0.69	0.63	0.68	0.61
Observations	17,379	17,379	17,379	17,379
Number of IPOs	446	446	446	446
Panel B: Issue Date				
Post Event Date	0.034***	0.040***	0.028**	0.039***
	(0.012)	(0.008)	(0.013)	(0.015)
VOI	0.553***	0.536***	0.558***	0.894***
	(0.023)	(0.035)	(0.025)	(0.080)
Post*VOI	-0.008	-0.042*	-0.003	-0.001
	(0.014)	(0.024)	(0.015)	(0.017)
Constant	10.939***	10.848***	10.935***	10.346***
	(0.160)	(0.197)	(0.193)	(0.220)
Adjusted R-Sqr	0.70	0.66	0.69	0.63
Observations	17,492	17,492	17,492	17,492
Number of IPOs	448	448	448	448
Panel C: Lockup Date				
Post Event Date	0.013	0.013	0.011	0.012
	(0.018)	(0.011)	(0.018)	(0.015)
VOI	0.561***	0.573***	0.593***	1.447***
	(0.028)	(0.064)	(0.028)	(0.120)
Post*VOI	0.006	-0.064	-0.013	-0.006
	(0.020)	(0.047)	(0.019)	(0.021)
Constant	10.308***	10.296***	10.298***	9.592***
	(0.298)	(0.347)	(0.283)	(0.343)
Adjusted R-Sqr	0.70	0.65	0.69	0.63
Observations	13,978	13,978	13,978	13,978
Number of IPOs	359	359	359	359
Property Characteristics	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y

(*) Threshold defined by county from the previous quarter. Displaying transaction level OLS estimates where the dependent variable is the natural log of sales price (June 2017 dollars). Displayed standard errors are clustered at the Firm level and the 1, 2, and 3 stars indicate statistical significance at 10%, 5%, and 1%, respectively. Transactions that are present in more than one IPO event per event are excluded.

Table 8. Pre-Post by Type of Shares Present at Issue Date by Distance

Dependent Variable: ln(Sales Price)	With Secondary Shares	Without Secondary Shares	With Lockup Shares	Without Lockup Shares
Panel A: at 1 Mile				
Post Event Date	0.022	0.043***	0.028***	0.073***
	(0.015)	(0.009)	(0.009)	(0.014)
Constant	11.201***	10.944***	10.424***	11.176***
	(0.320)	(0.216)	(0.241)	(0.401)
Adjusted R-Sqr	0.55	0.66	0.64	0.61
Observations	4,845	12,647	13,772	3,720
Number of IPOs	142	306	355	93
Panel B: at 5 Miles				
Post Event Date	0.014	0.028***	0.019***	0.046***
	(0.011)	(0.007)	(0.007)	(0.015)
Constant	9.710***	10.614***	9.623***	5.631***
	(0.174)	(0.115)	(0.117)	(0.176)
Adjusted R-Sqr	0.51	0.59	0.57	0.49
Observations	88,090	155,901	209,825	34,166
Number of IPOs	151	343	400	94
Panel C: at 10 Miles				
Post Event Date	0.002	0.016*	0.010	0.014
	(0.013)	(0.008)	(0.008)	(0.013)
Constant	9.665***	10.325***	9.660***	10.670***
	(0.202)	(0.074)	(0.102)	(0.177)
Adjusted R-Sqr	0.46	0.56	0.52	0.49
Observations	175,999	269,614	386,175	59,438
Number of IPOs	162	323	397	88
Property Type FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y

Displaying transaction level OLS estimates where the dependent variable is the natural log of sales price (December 2017 dollars). Displayed standard errors are clustered at the Firm level and the 1, 2, and 3 stars indicate statistical significance at 10%, 5%, and 1%, respectively. Transactions that are present in more than one IPO event per event are excluded.

Table 9. Pre-Post at 10 miles by Firm Age Quartile

Dependent Variable:	Q1	Q2	Q3	Q4
ln(Sales Price)	*Youngest*			*Oldest*
Panel A: Filed Date				
Post Event Date	0.028**	0.019	0.009	0.035**
	(0.013)	(0.012)	(0.016)	(0.015)
Adjusted R-Sqr	0.47	0.62	0.46	0.54
Observations	72,593	56,435	89,648	82,724
Number of IPOs	94	88	108	103
Panel B: Issue Date				
Post Event Date	0.036***	0.021	0.003	0.008
	(0.014)	(0.015)	(0.016)	(0.017)
Adjusted R-Sqr	0.49	0.60	0.44	0.51
Observations	78,481	50,685	117,371	91,992
Number of IPOs	89	96	115	106
Panel C: Lockup Date				
Post Event Date	0.043***	0.008	0.000	-0.001
	(0.013)	(0.017)	(0.012)	(0.015)
Adjusted R-Sqr	0.51	0.61	0.45	0.52
Observations	63,927	56,317	114,760	91,047
Number of IPOs	73	100	108	87
Property Characteristics	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y

Displaying transaction level OLS estimates where the dependent variable is the natural log of sales price (December 2017 dollars). Displayed standard errors are clustered at the Firm level and the 1, 2, and 3 stars indicate statistical significance at 10%, 5%, and 1%, respectively. Transactions that are present in more than one IPO event per event are excluded.

Table 10. Pre-Post at 10 miles by Total Firm Assets Quartile

Dependent Variable: ln(Sales Price)	Q1 Least	Q2	Q3	Q4 Most
Panel A: Filed Date				
Post Event Date	-0.012	0.015	0.011	0.031**
	(0.018)	(0.011)	(0.014)	(0.015)
Adjusted R-Sqr	0.61	0.48	0.58	0.48
Observations	44,203	82,966	106,096	136,273
Number of IPOs	82	99	110	110
Panel B: Issue Date				
Post Event Date	-0.014	0.010	0.024	0.018
	(0.020)	(0.017)	(0.016)	(0.013)
Adjusted R-Sqr	0.58	0.46	0.54	0.46
Observations	49,367	88,352	127,402	134,090
Number of IPOs	87	100	116	108
Panel C: Lockup Date				
Post Event Date	0.005	0.016	-0.001	0.008
	(0.017)	(0.015)	(0.012)	(0.011)
Adjusted R-Sqr	0.58	0.48	0.53	0.46
Observations	59,662	96,153	115,063	117,931
Number of IPOs	89	89	95	87
Property Characteristics	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y

Displaying transaction level OLS estimates where the dependent variable is the natural log of sales price (December 2017 dollars). Displayed standard errors are clustered at the Firm level and the 1, 2, and 3 stars indicate statistical significance at 10%, 5%, and 1%, respectively. Transactions that are present in more than one IPO event per event are excluded.

Table 11. Pre-Post at 10 miles by IPO Performance Quartile

Dependent Variable: ln(Sales Price)	Q1 *Lowest*	Q2	Q3	Q4 *Highest*
Panel A: IPO Returns (%) from Offer Price to Close of:				
Issue Date				
Post Event Date	0.020**	0.003	-0.016	0.051***
	(0.010)	(0.015)	(0.015)	(0.017)
Adjusted R-Sqr	0.53	0.49	0.53	0.46
Observations	131,842	92,519	125,152	68,253
Number of IPOs	117	113	118	100
Lockup Date				
Post Event Date	0.006	0.004	-0.007	0.023**
	(0.011)	(0.014)	(0.012)	(0.011)
Adjusted R-Sqr	0.56	0.50	0.48	0.47
Observations	103,693	111,262	101,639	91,536
Number of IPOs	93	100	97	95
Panel B: IPO Relative Volatility (%) from IPO to Close of:				
Lockup Date				
Post Event Date	0.002	-0.002	0.000	0.025***
	(0.010)	(0.015)	(0.014)	(0.008)
Adjusted R-Sqr	0.47	0.45	0.50	0.52
Observations	124,675	89,222	102,249	91,984
Number of IPOs	97	93	97	98
Property Characteristics	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y

Displaying transaction level OLS estimates where the dependent variable is the natural log of sales price (December 2017 dollars). Displayed standard errors are clustered at the Firm level and the 1, 2, and 3 stars indicate statistical significance at 10%, 5%, and 1%, respectively. Transactions that are present in more than one IPO event per event are excluded. IPO returns (%) are calculated as the percentage change from the IPO offer price to the most recent closing price for the lockup date or the date of the IPO at 1 year. IPO relative volatility is the standard deviation of closing prices divided by the average of closing prices over the period.

Table 12. Summary of by Firm by Event OLS Coefficient Estimates of Treatment

By Cutoff	Firms	Mean	S.D.
Panel A: At 1 Mile			
Cutoff of ≥ 10 Pre and Post Transactions			
Filed Date	260	0.028	0.154
Issue Date	271	0.039	0.194
Lockup Date	208	0.012	0.180
Cutoff of ≥ 25 Pre and Post Transactions			
Filed Date	135	0.034	0.111
Issue Date	131	0.043	0.100
Lockup Date	97	0.024	0.113
Cutoff of ≥ 50 Pre and Post Transactions			
Filed Date	40	0.043	0.080
Issue Date	41	0.032	0.073
Lockup Date	31	0.022	0.097
Panel B: At 5 Miles			
Cutoff of ≥ 10 Pre and Post Transactions			
Filed Date	515	0.033	0.086
Issue Date	525	0.028	0.103
Lockup Date	413	0.021	0.074
Cutoff of ≥ 25 Pre and Post Transactions			
Filed Date	508	0.030	0.076
Issue Date	512	0.024	0.070
Lockup Date	407	0.021	0.072
Cutoff of ≥ 50 Pre and Post Transactions			
Filed Date	494	0.031	0.071
Issue Date	499	0.025	0.068
Lockup Date	397	0.018	0.069

Displaying correlation estimates of firm level OLS measures of treatment where property characteristics are included as controls. The pre and post-periods include transactions within 90 days of the event date where the exact event date is included in the pre-period.

Table 13. Correlation Coefficients of by Firm by Event OLS Coefficient Estimates of Treatment and Firm/IPO Characteristics at 1 mile

Panel A: Firm Characteristics					
	Total Assets	IPO Sum of All Proceeds	No Lockup Flag	Secondary Shares Flag	Firm Age
Cutoff of ≥ 10 Pre and Post Transactions					
Filed Date	0.096	0.154	0.080	-0.014	-0.104
Issue Date	0.063	0.025	0.071	-0.082	0.069
Lockup Date	0.044	-0.009		-0.146	-0.032
Cutoff of ≥ 25 Pre and Post Transactions					
Filed Date	0.298	0.339	0.173	-0.022	-0.042
Issue Date	-0.033	0.101	0.122	0.018	0.059
Lockup Date	0.079	0.050		-0.173	0.115
Cutoff of ≥ 50 Pre and Post Transactions					
Filed Date	0.008	0.408	0.265	-0.210	-0.062
Issue Date	-0.045	0.154	0.335	-0.083	0.029
Lockup Date	0.086	0.088		-0.348	0.024

Panel B: IPO Performance Measures					
	Offer Price to Issue (%Δ)	Offer Price to Lockup (%Δ)	at Lockup Rel. Vol.	Offer Price to 1 Year (%Δ)	at 1 Year Rel. Vol.
Cutoff of ≥ 10 Pre and Post Transactions					
Filed Date	0.040	0.047	-0.024	-0.032	-0.058
Issue Date	0.061	0.006	-0.130	-0.013	-0.026
Lockup Date	0.088	0.115	0.062	-0.066	0.079
Cutoff of ≥ 25 Pre and Post Transactions					
Filed Date	0.148	0.045	0.027	-0.096	0.018
Issue Date	0.085	-0.045	-0.006	0.096	-0.031
Lockup Date	0.194	0.231	-0.152	0.108	-0.089
Cutoff of ≥ 50 Pre and Post Transactions					
Filed Date	0.112	0.016	0.260	-0.305	0.263
Issue Date	0.290	0.245	-0.006	0.148	-0.031
Lockup Date	0.328	0.447	-0.015	0.499	0.012

Displaying correlation estimates of firm level OLS measures of treatment where property characteristics are included as controls. The pre and post-periods include transactions within 90 days of the event date where the exact event date is included in the pre-period. IPO returns (%) are calculated as the percentage change from the IPO offer price to the most recent closing price for the lockup date or the date of the IPO at 1 year. IPO relative volatility is the standard deviation of closing prices divided by the average of closing prices over the period.

Table 14. Correlation Coefficients of by Firm by Event OLS Coefficient Estimates of Treatment and Firm/IPO Characteristics at 5 miles

Panel A: Firm Characteristics					
	Total Assets	IPO Sum of All Proceeds	No Lockup Flag	Secondary Shares Flag	Firm Age
Cutoff of ≥ 10 Pre and Post Transactions					
Filed Date	0.051	0.055	0.137	-0.082	-0.059
Issue Date	-0.072	0.020	0.029	-0.018	0.081
Lockup Date	-0.043	0.028		-0.004	-0.139
Cutoff of ≥ 25 Pre and Post Transactions					
Filed Date	0.053	0.065	0.148	-0.121	-0.077
Issue Date	-0.067	0.042	0.110	-0.063	-0.043
Lockup Date	-0.042	0.030		-0.014	-0.100
Cutoff of ≥ 50 Pre and Post Transactions					
Filed Date	0.031	0.066	0.163	-0.132	-0.042
Issue Date	-0.074	0.044	0.119	-0.082	-0.052
Lockup Date	-0.037	0.035		-0.036	-0.097

Panel B: IPO Performance Measures					
	Offer Price to Issue (%Δ)	Offer Price to Lockup (%Δ)	at Lockup Rel. Vol.	Offer Price to 1 Year (%Δ)	at 1 Year Rel. Vol.
Cutoff of ≥ 10 Pre and Post Transactions					
Filed Date	0.098	-0.003	0.086	-0.055	0.135
Issue Date	0.148	0.000	-0.054	-0.012	0.008
Lockup Date	0.123	0.198	-0.017	0.125	-0.023
Cutoff of ≥ 25 Pre and Post Transactions					
Filed Date	0.133	0.004	0.111	-0.065	0.154
Issue Date	0.255	-0.020	-0.062	-0.020	0.036
Lockup Date	0.117	0.206	-0.017	0.122	-0.024
Cutoff of ≥ 50 Pre and Post Transactions					
Filed Date	0.164	-0.002	0.100	-0.074	0.156
Issue Date	0.274	-0.029	-0.061	-0.020	0.052
Lockup Date	0.139	0.247	-0.019	0.159	-0.033

Displaying correlation estimates of firm level OLS measures of treatment where property characteristics are included as controls. The pre and post-periods include transactions within 90 days of the event date where the exact event date is included in the pre-period. IPO returns (%) are calculated as the percentage change from the IPO offer price to the most recent closing price for the lockup date or the date of the IPO at 1 year. IPO relative volatility is the standard deviation of closing prices divided by the average of closing prices over the period.

Table 15. Autocorrelation of Firm Level Coefficient Estimates of Treatment at 5 miles

	Filed Date	Issue Date	Lockup Date
Panel A: Correlation Coefficients			
Cutoff of $\geq$ 10 Pre and Post Transactions			
Filed Date	1.000		
Issue Date	0.118	1.000	
Lockup Date	0.019	-0.103	1.000
Cutoff of $\geq$ 25 Pre and Post Transactions			
Filed Date	1.000		
Issue Date	0.164	1.000	
Lockup Date	0.034	-0.062	1.000
Cutoff of $\geq$ 50 Pre and Post Transactions			
Filed Date	1.000		
Issue Date	0.232	1.000	
Lockup Date	0.011	-0.092	1.000
Panel B: By Number of Firms			
Cutoff of $\geq$ 10 Pre and Post Transactions			
Filed Date	515		
Issue Date	511	525	
Lockup Date	389	399	413
Cutoff of $\geq$ 25 Pre and Post Transactions			
Filed Date	508		
Issue Date	504	512	
Lockup Date	385	390	407
Cutoff of $\geq$ 50 Pre and Post Transactions			
Filed Date	494		
Issue Date	488	499	
Lockup Date	371	379	397

Displaying correlation estimates of firm level OLS measures of treatment where property characteristics are included as controls. The pre and post-periods include transactions within 90 days of the event date where the exact event date is included in the pre-period.

Table 16. Firm Level Summary

Issuer	Facebook Inc	Google Inc	Twitter Inc
Panel A: Firm and IPO Characteristics			
Firm Age	8	6	7
Total Assets ($ mil)	6,859	1,328	993
IPO Offer Price	38	85	26
Proceeds Amount ($ mil)	16,007	1,915	2,093
Shares Outstanding After Offer	2,138,000,000	271,200,000	555,200,000
Secondary Shares of Shares Offered	241,200,000	5,462,917	
Secondary Shares of Shares Offered (%)	57	28	0
Primary Shares of Shares Offered (%)	43	72	100
Panel B: IPO Returns (%) from Offer Price to Close of			
Issue Date	0.61	18.04	72.69
Lockup Date	-47.71	19.42	49.04
IPO at 1 year	-30.92	229.40	57.08
Panel C: IPO Relative Volatility (%) from IPO to Close of			
Lockup Date	15.56	3.18	16.56
IPO at 1 year	15.77	28.51	19.24

 IPO returns (%) are calculated as the percentage change from the IPO offer price to the most recent closing price for the lockup date or the date of the IPO at 1 year. IPO relative volatility is the standard deviation of closing prices divided by the average of closing prices over the period.

Table 17. Transaction Level Descriptive Statistics by Firm

Variables	Mean	S.D.	Minimum	Maximum
Panel A: Facebook Inc at 5 miles and 90 days				
Sales Price	1,491,879	1,691,618	2,000	21,750,000
Sales Price*	1,614,614	1,828,451	2,167	23,457,038
Land (sf)	22,115	372,217	512	10,000,069
Total Rooms	7.02	2.20	0.00	19.00
Bed Rooms	3.25	1.05	1.00	8.00
Full Bathrooms	2.20	1.05	1.00	8.00
Half Bathrooms	0.25	0.44	0.00	1.00
Age	51.09	26.19	0.00	109.00
Stories	1.30	0.49	1.00	3.00
Observations	1,441			
Panel B: Google Inc at 5 miles and 90 days				
Sales Price	761,098	505,289	5,000	12,700,000
Sales Price*	999,141	664,160	6,498	16,732,891
Land (sf)	9,131	189,195	512	10,000,069
Total Rooms	6.49	1.86	1.00	15.00
Bed Rooms	2.92	0.95	1.00	9.00
Full Bathrooms	1.95	0.72	1.00	7.00
Half Bathrooms	0.35	0.48	0.00	1.00
Age	35.16	21.45	0.00	101.00
Stories	1.39	0.55	1.00	3.00
Observations	2,794			
Panel C: Twitter Inc at 5 miles and 90 days				
Sales Price	1,189,188	960,534	2,000	11,000,000
Sales Price*	1,253,474	1,011,562	2,094	11,516,995
Land (sf)	4,056	25,987	808	1,137,903
Total Rooms	6.90	2.18	0.00	17.00
Bed Rooms	3.13	1.12	1.00	9.00
Full Bathrooms	2.22	1.07	1.00	8.00
Half Bathrooms	0.00	0.04	0.00	1.00
Age	76.70	26.18	0.00	134.00
Stories	1.53	0.65	1.00	3.00
Observations	2,077			

Displaying California IPOs and property transactions from cleaned data sample. (*) are adjusted or current prices using the monthly CPI or Consumer Price Index for All Urban Consumers: All Items (to December 2017 prices).

Table 18. Sales Price by Firm and IPO Event

	Total		Pre		Post		T-Stat
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Diff.
Panel A: Facebook Inc							
At 5 Miles and 90 Days							
Filed Date	629,279	563,366	617,520	528,570	640,645	594,880	2.71
Issue Date	646,357	740,927	654,034	828,953	638,329	635,938	-1.40
Lockup Date	668,347	912,462	690,948	1,089,577	645,953	693,064	-2.92
At 10 Miles and 90 Days							
Filed Date	962,458	1,046,469	919,071	1,021,422	995,067	1,064,037	1.97
Issue Date	1,107,626	1,302,479	1,039,453	1,120,452	1,177,121	1,461,993	3.19
Lockup Date	1,131,537	1,341,498	1,172,017	1,453,433	1,085,716	1,201,091	-1.89
Panel B: Google Inc							
At 5 Miles and 90 Days							
Filed Date	1,000,426	714,765	993,529	635,877	1,006,327	776,215	0.37
Issue Date	991,647	668,993	989,682	751,588	993,933	558,185	0.13
Lockup Date	987,215	556,426	961,754	522,277	1,017,355	593,262	2.02
At 10 Miles and 90 Days							
Filed Date	937,391	735,448	956,083	791,269	922,717	688,221	-1.77
Issue Date	958,534	721,347	944,388	649,587	974,902	796,164	1.61
Lockup Date	960,202	705,518	940,302	594,198	983,839	817,787	2.31
Panel C: Twitter Inc							
At 5 Miles and 90 Days							
Filed Date	1,201,027	958,956	1,147,601	927,995	1,258,857	989,114	1.82
Issue Date	1,209,390	982,272	1,234,634	1,093,861	1,175,555	809,114	-0.89
Lockup Date	1,314,508	1,064,281	1,300,317	1,004,717	1,327,297	1,116,056	0.40
At 10 Miles and 90 Days							
Filed Date	903,849	735,088	883,321	706,946	926,027	764,061	1.33
Issue Date	907,696	755,126	920,325	823,887	890,522	650,164	-0.85
Lockup Date	990,456	817,441	974,761	789,289	1,004,013	841,118	0.81

Displaying California mean differences of sales price for property transactions in current (December 2017) dollars that are identified as falling in a pre or post IPO event window by firm. The pre and post-periods include transactions within 90 days of the event date where the exact event date is included in the pre-period.

Table 19. Pre-Post at 5 Miles by Firm

Dependent Variable: ln(Sales Price)	Filed Date	Issue Date	Lockup Date
Panel A: Facebook Inc			
Post Event Date	0.134**	0.099**	0.075
	(0.060)	(0.049)	(0.046)
Constant	9.488***	9.890***	10.011***
	(0.666)	(0.882)	(0.891)
Property Characteristics	Y	Y	Y
Adjusted R-Sqr	0.47	0.48	0.50
Observations	638	792	705
Panel B: Google Inc			
Post Event Date	0.020	0.038**	0.030
	(0.020)	(0.018)	(0.019)
Constant	11.019***	11.289***	11.553***
	(0.202)	(0.332)	(0.366)
Property Characteristics	Y	Y	Y
Adjusted R-Sqr	0.47	0.49	0.48
Observations	1,735	1,707	1,640
Panel C: Twitter Inc			
Post Event Date	0.090**	0.023	-0.039
	(0.039)	(0.039)	(0.043)
Constant	11.296***	11.257***	10.513***
	(0.621)	(0.725)	(0.530)
Property Characteristics	Y	Y	Y
Adjusted R-Sqr	0.18	0.18	0.18
Observations	985	894	981

Displaying transaction level OLS estimates where the dependent variable is the natural log of sales price (December 2017 dollars). Displaying robust standard errors and the 1, 2, and 3 stars indicate statistical significance at 10%, 5%, and 1%, respectively.

Table 20. Pre-Post at 10 Miles by Firm

Dependent Variable: ln(Sales Price)	Filed Date	Issue Date	Lockup Date
Panel A: Facebook Inc			
Post Event Date	0.095***	0.086***	-0.019
	(0.021)	(0.020)	(0.021)
Constant	10.862***	10.872***	10.956***
	(0.191)	(0.189)	(0.221)
Property Characteristics	Y	Y	Y
Adjusted R-Sqr	0.48	0.48	0.45
Observations	3,011	3,643	3,458
Panel B: Google Inc			
Post Event Date	0.031***	0.033***	0.026**
	(0.010)	(0.010)	(0.010)
Constant	10.778***	11.196***	11.253***
	(0.156)	(0.139)	(0.144)
Property Characteristics	Y	Y	Y
Adjusted R-Sqr	0.52	0.48	0.48
Observations	6,205	5,794	5,629
Panel C: Twitter Inc			
Post Event Date	0.048*	0.006	0.015
	(0.027)	(0.028)	(0.027)
Constant	12.995***	12.925***	12.088***
	(0.313)	(0.335)	(0.306)
Adjusted R-Sqr	0.17	0.18	0.18
Observations	2,097	1,895	2,080

Displaying transaction level OLS estimates where the dependent variable is the natural log of sales price (December 2017 dollars). Displaying robust standard errors and the 1, 2, and 3 stars indicate statistical significance at 10%, 5%, and 1%, respectively.

Appendix

Initial Public Offering (IPO) Date Events

- **IPO filing event:** when a firm submits the appropriate documents required for the IPO. The filing event date is the date that a firm files Form S-1 with the U.S Securities and Exchange Commission (SEC).

- **IPO issuing event:** when the firm's equity is listed on an exchange. This is the date when the firm goes public. Issuing coincides with a firm's submission of their IPO prospectus Form 424 with the SEC.

- **Lockup event:** when restrictions on some shareholders and insiders are lifted allowing them to sell and liquidate their shares. It is usually 180 days.

Changes in the IPO Landscape Over this Sample Period

The decision to pursue an IPO is taken as exogenous and is assumed to be independent of local house price changes. However, regulatory changes over this period that impact IPOs may fundamentally change the composition of the sample of firms that choose to go public. This is a concern if the change in composition correlates with house prices in proximity to the firm's headquarters and cannot be controlled by specifications that include controls to capture variation at the firm level and over time.

In Gao et al. (2013), they identify a significant drop in the number of IPOs annually spanning 2001 to 2013 than during 1980 to 2000. They attribute this difference to changing market and regulatory conditions that make it more advantageous for small private firms to be acquired than to go public. Iliev (2010) found that the passage of the Sarbanes-Oxley Act (SOX) in 2002 and the requirements, specifically, under Section 404 imposed additional compliance costs reducing the value of small firms. In 2012 congress passed the Jumpstart our Jobs Act intended to increase the frequency of IPOs by lowering the cost of going public. For example, under the JOBS Act firms considering an IPO can test-the-waters and communicate with potential investors prior to submitting the registration Form S-1 publicly. Dambra et al. (2015) find that the changes implemented under the JOBS Act increased IPO activity in the two years following its passage. The issue of IPO composition and regulatory changes is compounded by evidence of hot and cold IPO markets going back to Ibbotson and Jaffe (1975) and Ritter (1984).

Table A1. Property Transaction Level Descriptive Statistics by IPO Event

	Total		Pre		Post		T-Stat
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Diff.
Panel A: Filed Date							
Sales Price	478,268	511,800	468,477	481,604	487,733	539,241	2.48
Sales Price*	629,279	563,366	617,520	528,570	640,645	594,880	2.71
Land SF	9,529	200,775	7,677	153,143	11,320	237,914	1.20
Total Rooms	6.35	1.94	6.37	1.97	6.32	1.91	-1.57
Bed Rooms	3.02	0.94	3.02	0.94	3.02	0.94	-0.25
Full Bathrooms	1.99	0.69	1.98	0.70	1.99	0.68	0.89
Half Bathrooms	0.32	0.47	0.32	0.47	0.33	0.47	0.67
Age	30.55	23.75	30.83	23.75	30.28	23.75	-1.51
Stories	1.44	0.57	1.44	0.57	1.44	0.57	0.32
Distance from IPO	0.72	0.21	0.72	0.21	0.72	0.21	0.00
Days from IPO	1.82	52.01	-44.11	25.91	46.22	25.69	230.76
Observations	17,379		8,542		8,837		
Number of IPOs	446						
Panel B: Issue Date							
Sales Price	494,764	690,792	504,203	783,847	484,894	577,560	-1.85
Sales Price*	646,357	740,927	654,034	828,953	638,329	635,938	-1.40
Land SF	9,494	200,167	8,920	183,276	10,095	216,432	0.39
Total Rooms	6.31	1.90	6.30	1.90	6.32	1.91	0.63
Bed Rooms	3.01	0.93	3.00	0.93	3.01	0.94	1.16
Full Bathrooms	1.98	0.69	1.99	0.70	1.98	0.68	-0.52
Half Bathrooms	0.33	0.47	0.33	0.47	0.33	0.47	0.18
Age	30.75	23.78	30.48	23.65	31.03	23.91	1.51
Stories	1.43	0.57	1.43	0.57	1.44	0.56	0.43
Distance from IPO	0.71	0.21	0.71	0.21	0.71	0.21	-1.36
Days from IPO	-0.08	52.28	-44.32	26.50	46.18	25.88	228.39
Observations	17,492		8,941		8,551		
Number of IPOs	448						
Panel C: Lockup Date							
Sales Price	516,465	790,897	533,763	926,098	499,324	628,485	-2.57
Sales Price*	668,347	912,462	690,948	1,089,577	645,953	693,064	-2.92
Land SF	8,247	169,264	8,281	169,739	8,213	168,805	-0.02
Total Rooms	6.38	2.06	6.41	1.95	6.35	2.16	-1.69
Bed Rooms	3.02	0.96	3.04	0.96	3.01	0.97	-1.75
Full Bathrooms	1.99	0.70	2.00	0.71	1.98	0.70	-2.16
Half Bathrooms	0.34	0.48	0.36	0.48	0.33	0.47	-3.24
Age	30.67	24.27	30.30	24.04	31.03	24.48	1.78
Stories	1.47	0.60	1.48	0.60	1.46	0.59	-1.31
Distance from IPO	0.71	0.21	0.70	0.21	0.71	0.21	2.76
Days from IPO	0.64	52.38	-44.91	26.55	45.76	25.91	204.32
Observations	13,978		6,957		7,021		
Number of IPOs	359						

Displaying California property transactions that are identified as falling in a pre or post IPO event window. The pre and post-periods include transactions within 90 days of the event date and within 1 mile of the IPO firm's headquarters. The exact event date is included in the pre-period and transactions present in more than one pre-post window per event are excluded.

Table A2. Bounded at 1 miles with Bands at 0.25 and 0.5 miles

Dependent Variable: ln(Sales Price)	Filed Date	Issue Date	Lockup Date
Post Event Date	0.039***	0.042***	0.007
	(0.010)	(0.009)	(0.013)
Distance < 0.25 miles	-0.083	0.002	0.012
	(0.070)	(0.034)	(0.032)
Distance ≥ 0.25 & < 0.5 miles	0.029	0.035**	0.013
	(0.021)	(0.017)	(0.017)
Post*(Distance < 0.25 miles)	0.087	0.013	0.003
	(0.067)	(0.040)	(0.041)
Post*(Distance ≥ 0.25	-0.016	-0.030	0.005
& < 0.5 miles)	(0.022)	(0.019)	(0.021)
Ln(Land SF)	0.157***	0.164***	0.185***
	(0.021)	(0.020)	(0.020)
Total Rooms	0.046***	0.055***	0.035**
	(0.010)	(0.006)	(0.015)
Bedrooms	0.008	0.008	0.005
	(0.012)	(0.009)	(0.019)
Full Bathrooms	0.121***	0.098***	0.126***
	(0.012)	(0.011)	(0.015)
Half Bathrooms	0.092***	0.095***	0.114***
	(0.014)	(0.014)	(0.016)
Age	-0.013***	-0.014***	-0.015***
	(0.002)	(0.002)	(0.003)
Age Squared	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
Age Cubed	-0.000**	-0.000***	-0.000**
	(0.000)	(0.000)	(0.000)
Age ≥ 50 Years	-0.005	-0.023	0.011
	(0.032)	(0.027)	(0.034)
Stories > 1 & < 2	0.030	0.015	0.076**
	(0.039)	(0.031)	(0.032)
2 Story	0.055***	0.048***	0.070***
	(0.018)	(0.016)	(0.019)
Stories > 2 & < 3	0.209**	0.084***	-0.046
	(0.103)	(0.021)	(0.300)
3 Story	0.090**	0.083**	0.110***
	(0.035)	(0.037)	(0.034)
2nd Home	0.014	0.054	-0.045
	(0.027)	(0.037)	(0.049)
PUD	0.062***	0.051***	0.061***
	(0.019)	(0.018)	(0.017)
Condominium	-0.059**	-0.054*	-0.052**
	(0.024)	(0.032)	(0.024)
Constant	10.650***	10.332***	9.586***
	(0.240)	(0.220)	(0.343)
Property Type FE	Y	Y	Y
Firm FE	Y	Y	Y
Adjusted R-Sqr	0.61	0.63	0.63
Observations	17,379	17,492	13,978
Number of IPOs	446	448	359

Displaying transaction level OLS estimates where the dependent variable is the natural log of sales price (December 2017 dollars). Displayed standard errors are clustered at the Firm level and the 1, 2, and 3 stars indicate statistical significance at 10%, 5%, and 1%, respectively. Transactions that are present in more than one IPO event per event are excluded.