Citi GPS

HOME OF THE FUTURE

PropTech – Towards a Frictionless Housing Market?

Citi GPS: Global Perspectives & Solutions

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HOME OF THE FUTURE

PropTech – Towards a Frictionless Housing Market?

Kathleen Boyle, CFA
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If you bought or sold a house in the past 20 years, it was likely a memorable experience. If your experience was anything like mine, it included real estate agents, mortgage brokers, title companies, insurance companies, lawyers, housing inspectors, and country clerks to deal with. There was very little technology utilized throughout the process, and when it finally came to closing day, you faced a huge stack of documents that needed to be signed, initialed, stamped, and certified.

For most people, buying a home is the biggest financial transaction they will make in their lifetime. This fact alone can lead to stress even before the buying process begins. The path to becoming a homeowner often starts with personal decisions like choosing a location, assessing how much to spend on a home, and deciding how much of the purchase price to finance. This is followed by finding a real estate broker, going to open houses, finding the right house, negotiating a purchase price, securing financing, and closing the transaction. The whole process gets even more complicated if the new house purchase relies on the sale of an existing house.

Despite many industries welcoming the advancement of technology over the past decades, the process of buying and selling a home has for the most part remained unchanged. Real estate listings migrated online and home searches can now be done from the comfort of the sofa, but large-scale technological changes have not occurred. Given the housing market is hyperlocal by nature and heavily regulated, the potential upside from innovation seems limited. There is also a feeling that players are too small to benefit from innovation at scale.

Similar to other industries, however, the pandemic has acted as a catalyst for change in the housing market. The prospect of remote work and the rush to move away from congested cities has led to growing demand in a housing market that already had tight supply. This has led to a significant decline in the amount of time houses spend on the market and stretched housing affordability.

Supply-demand imbalances and affordability factors are driving technology adoption into the housing market. PropTech, or fintech for real estate, is being incorporated across the home buying experience to make real estate transactions more efficient. The total addressable market for mortgage technology is an estimated $14 billion and the technology developed to make the mortgage process more efficient could lead to cost savings for mortgage originators, faster loan closing times, and faster processing times.

New PropTech solutions to help buyers finance their transactions and better manage the timing logistics when both buying and selling a home are also starting to take hold. Finally, the increase in institutional ownership in the rental market is driving the use of efficiency technology in property management. As a larger share of single-family rental homes are held by institutions, they are utilizing technology platforms to manage things like repairs and security, and maximizing efficiencies and profit margins.

Strengthening the foothold of technology in the real estate market should help move the industry towards being “frictionless” and potentially drive democratization of information and data while improving on the legacy ways of doing business.

TOWARD A FRICTIONLESS U.S. HOUSING MARKET?

WHY INNOVATE IN HOUSING?

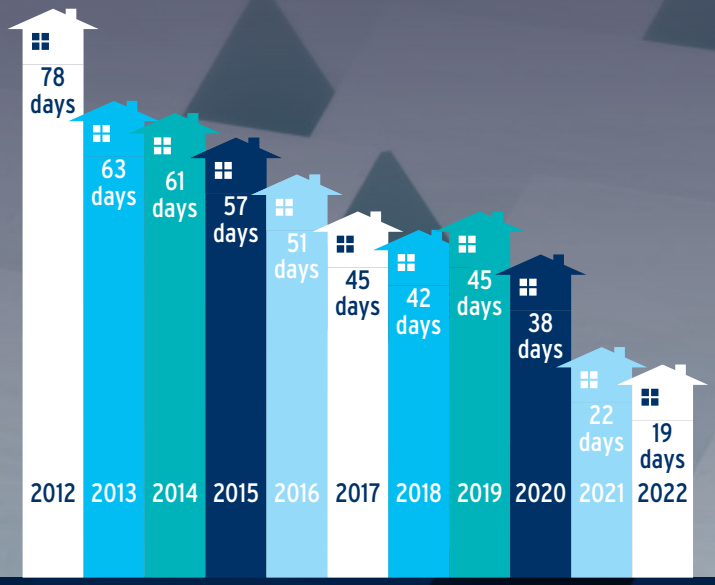
The housing sector drives economic growth like few other sectors of the global economy. But, despite its importance to GDP in developing and emerging economies, technology uptake has lagged other sectors. This is is now changing as tight supply and growing demand for housing has intensified the need for faster transaction speeds.

Tight Supply/Demand Dynamics Persist

Source: National Association of Realtors (NAR)

Time to Sell Has Significantly Compressed

Source: Redfin, Citi Research



INNOVATION IN THE HOUSING ECOSYSTEM

With the housing/mortgage market comprised of an ecosystem of co-dependent firms and their legacy systems, wholesale innovation is difficult to implement. However, technological innovation is accelerating as (1) tech startups drive efficiency across the transaction process amid a tight housing market, and (2) institutional investors make property management more efficient for single-family rentals.

Real Estate Tech Disruptors: Where They Are Innovating in the Transaction

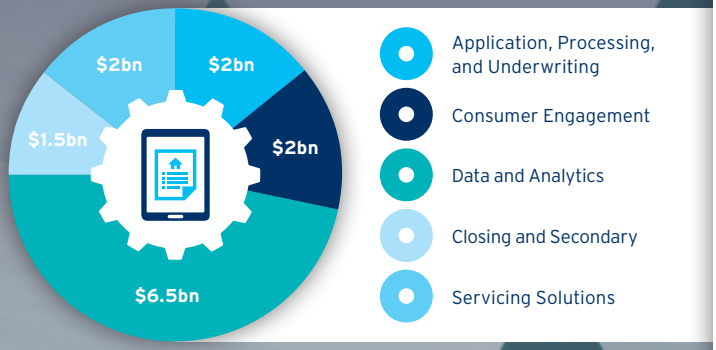
Source: Citi Research

INNOVATING FINANCE AND PROCESS TECH

Real estate technology companies are now aiming to streamline various aspects of the real estate transaction. Mortgage underwriting, title insurance, and other processes are ripe for innovation with a combined total addressable market (TAM) for technology of $34 billion to $36 billion. Combining escrow and closing services on a tech platform, for example, could speed up closing times by 15%-25%. Because of improved technologies and marketing efforts, some of the fastest-growing mortgage originators are digital-first lenders with 100% end-to-end digital underwriting processes.

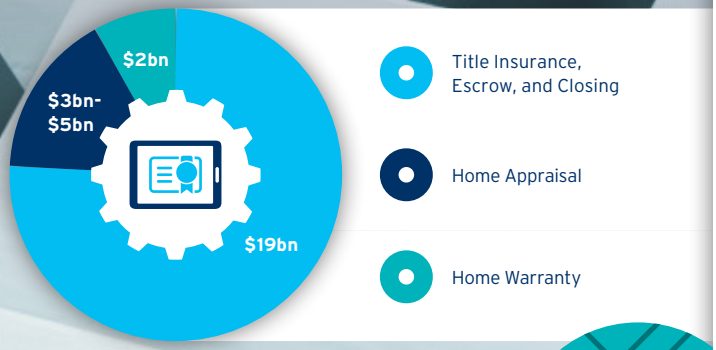
Mortgage Technology Estimated TAM

Source: Company Reports and Citi Research



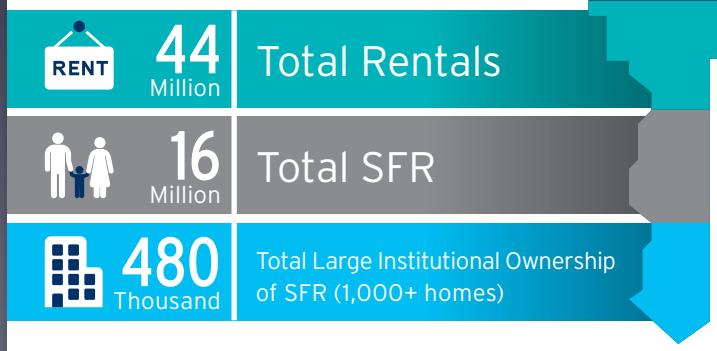
Title Insurance and Other Process Technology Estimated TAM

Source: Citi Research, Mortgage Bankers Association, Consumer Financial Protection Bureau, U.S. Census Bureau, NAR, Haver



U.S. Rental Housing Market

Source: U.S. Census Bureau, Company Filings, Citi Research

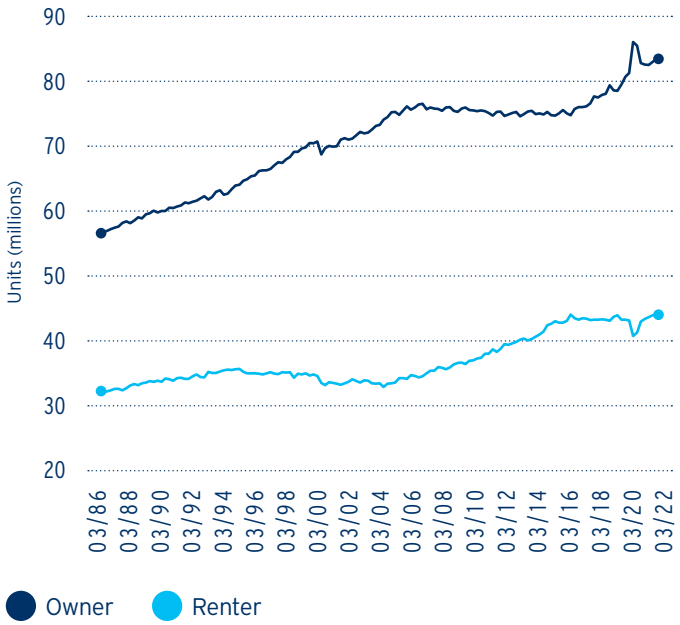


INNOVATING PROPERTY MANAGEMENT

Since 2008, the institutional single-family rental (SFR) industry has grown from zero to ~480,000 homes, or 3% of the total SFR market in the U.S. Equity capital raised for SFR acquisitions hit $44 billion in 2021 versus just $3.6 billion combined in 2019 and 2020. Institutional ownership of SFRs is driving technology adoption at scale in a quest to increase efficiency a nd i ncrease r evenue through ancillary service offerings. However, institutional SFRs and build-for-rent practices have attracted environmental, social, and governance (ESG) scrutiny, especially around denying individuals opportunities for wealth creation in the home ownership arena.

U.S. Renter- vs. Owner-Occupied Housing Units

Source: U.S. Census Bureau, Citi Research



Contents

Introduction

Do you remember a time when simply getting driving directions to a home address created a challenge and required at least a modest amount of effort? The idea of purchasing a home on your own required access to data and knowledge that was complex and largely out of reach. Today, however, is a different story. With the ubiquity of internet access, getting information such as driving directions has become so easy that scientists are beginning to worry it is shrinking our brains.[1] The democratization of real estate data is not far behind. Access to an abundance of information is now available on nearly any home — enabling the average homeowner with significantly more information about the worth of their property and allowing the average homebuyer to conduct the majority of their search potentially from their sofa. While the acceleration of data availability might conjure up the image of a rocket leaving the atmosphere, the average residential real estate transaction would still bring up the image of a used car with a cassette tape player. In this report, we examine technologies to bring the market to its full potential.

Housing drives economic growth like few other sectors of the global economy. It represents sizeable portions of gross domestic product (GDP) both in developed and emerging economies. According to the National Association of Home Builders (NAHB) and Eurostat, housing investments and housing services represent ~17% of GDP in the U.S. and ~13% of GDP in the European Union. When accounting for underreporting in the informal sector, emerging markets likely generate a similar share of GDP from housing.

Homes provide value throughout their life cycle, with a fairly continuous stream of spending on repairs and remodeling, various upgrades, and retrofits. Accordingly, housing has a large multiplier effect, meaning that as residential construction increases, activity in vertically adjacent industries increases at a higher multiple, circulating capital back into the economy. According to the U.S. Bureau of Economic Analysis, construction ranks fifth among U.S. domestic industries in overall multiplier effect, with a multiplier of 3.02 — in other words, for every dollar invested in construction, about $3 is added to national GDP. Affordable and lower-income housing tends to have a higher multiplier, as in addition to job creation, lower-income households generally have a lower propensity to save, thereby recirculating more wealth. This positions emerging economies — with an overall greater need for affordable housing — to potentially drive outsized economic as well as social benefits from investing in the residential sector. In emerging markets, housing can offer a unique store of value/wealth given unstable currencies (e.g., home purchases in Buenos Aires are predominately all cash and in U.S. dollars), sanctions on the banking system (e.g., Russia, Iran), and less developed local financial markets (e.g., China).

More important than the headline economic impact, housing is of course a basic human need, and is recognized as a right by a number of governments and international organizations. Article 25 of the UN Universal Declaration of Human Rights recognizes the right to housing as part of the right to an adequate standard of living, and in 2019 Canada became the most recent country to legally recognize a federal right to housing. Whether by outright guarantee or (more commonly) through various subsidies and tax credits, policymakers explicitly or implicitly seek to make housing affordable or attainable. The health of the housing market is a key driver of consumer (and voter) confidence, as the home is typically the largest purchase a consumer makes in their lifetime.

[1] David Mosher, “High Wired: does Addictive Internet Use Restructure the Brain,” *Scientific American*, June 17, 2011.

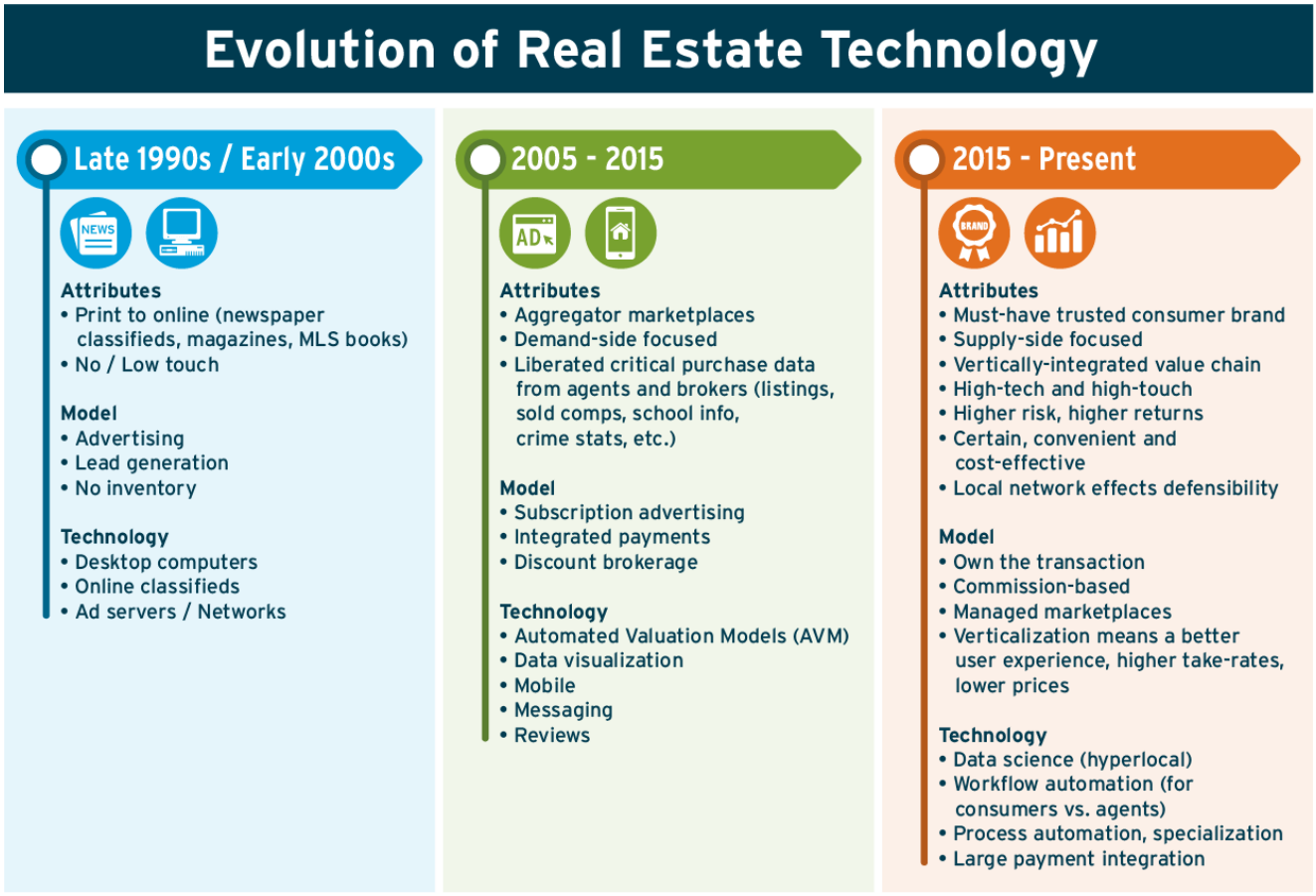
The home also shapes identity and life, even more so in the wake of COVID-19. Given their experience during the pandemic, homeowners increasingly view their homes as not only the center of family life, but also as an office, a gym, and a schooling center. Socially, the housing sector supports a broad and inclusive labor force (e.g., developers, laborers, lawyers, brokers), is labor-intensive, and as an industry has a high value-add per worker relative to other industries.

While housing is a primary driver of global economic growth, innovation in the housing sector has lagged other sectors over the last 30 years despite the emergence of a digital revolution over that period. Compared to other sectors in the economy, participants in the housing market — including real estate investment trusts or REITs, homebuilders, and brokers — generally spend little to nothing on research and development (R&D). The housing market is generally viewed as hyperlocal, in that it is made up of players too small to drive major innovations or benefit from those innovations at scale. The average U.S. home is approximately 37 years old, meaning it takes longer to test and deploy new technologies and materials. Regulatory environments are also fragmented, making it difficult to deploy innovations across a complex landscape of federal, state, and local laws, regulations, and building codes. Finally, the sector has generally seen underinvestment in the wake of the Global Financial Crisis, which was in many ways centered on an overheated U.S. housing market.

The Citi GPS *Home of the Future* series examines how the housing market can harness technological and financial innovations to make homes greener, more affordable, and more accessible to homebuyers. In the first installment of our series, *Building for Net Zero*, we explored environmental performance in housing. Homes are responsible for approximately 17% of greenhouse gas (GHG) emissions globally and around 20% of emissions in the U.S. The home of the future will be carbon neutral and built utilizing next-generation technologies such as modular construction and offsite manufacturing. While manufacturing industries have achieved step-changes in labor productivity, by some measures homebuilding is less efficient than it was 30 years ago.

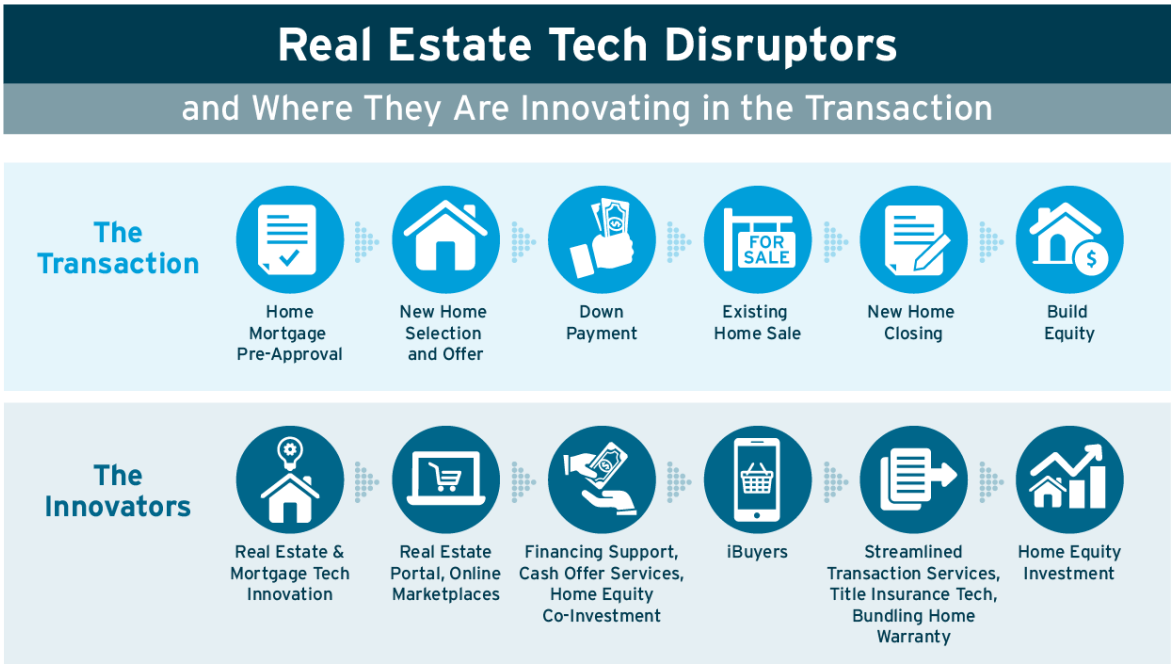
In this next chapter of the Home of the Future series, *PropTech — Towards a Frictionless Housing Market?*, we examine how technology is making inroads into an historically cumbersome and paper-heavy ordeal — the real estate transaction. Over the last 30 years, we have shifted from print to online, freed up the inventory of home listings from protected subscription sources, and moved to automate many processes across the buying, selling, and financing of homes. In the second half of the last decade, technology startups focused even more on industry disruption. They are now innovating new ways for individuals to interact with the housing ecosystem and driving efficiency across the transaction process. Below we will focus on some business models that our analysts have found interesting.

Figure 1. Evolution of Real Estate Technology



Source: Citi Research

Figure 2. Real Estate Tech Disruptors and Where They Are Innovating in the Transaction



Source: Citi Research

PropTech: Fintech in Real Estate

In many ways, it seems the onset of the pandemic irrevocably changed both the nature of the housing market and the average American's relationship to their home. At the highest level, it is clear that space and accommodation preferences have superseded proximity to social and commercial hubs, as more of the human experience has come to feature a remote participation option. But even in the more grounded terms of housing finance, the sea-change has been clear. This is especially true in areas where technological progress was natural but inhibited simply by the inertial force of incumbent service providers.

The housing/mortgage market is an ecosystem of codependent firms and their legacy systems — a reliance on this ecosystem can make it difficult for a marginal new entrant to enact wholesale innovation. Additionally, by virtue of being a mature and heavily regulated industry, the profitability upside to innovation is comparatively limited versus the upfront costs and downside of compliance issues. The need to act — and quickly — that was spawned during the pandemic bridged some of this problem and provided the impetus for many of these natural advancements to become commonplace, such as remote closing and E-notes. It has also been an accommodating environment for technology-driven upstarts to make inroads, and the government-sponsored enterprise (GSE) — Fannie Mae and Freddie Mac — scorecards set by federal housing finance regulators have prioritized technology-driven alternatives in home appraisals and credit scoring in 2022.

But the current environment has cultivated new challenges while exacerbating old ones. Stretched housing affordability in both the rental and purchase market has brought in institutional players — and the innovation they may provide — albeit under public and governmental scrutiny. Even starker is the full retreat of one of the largest iBuyers from the business despite the backdrop of one of the strongest housing markets in American history.

On balance, however, the clear takeaway has been that innovation works, and the profits generated around the housing market during this period have boosted investments in technology and operating platforms across a host of market segments. While incremental innovations will likely carry the day, the present is nevertheless one of the most exciting periods of evolution in American housing.

Innovation Starting to Take Hold in Housing

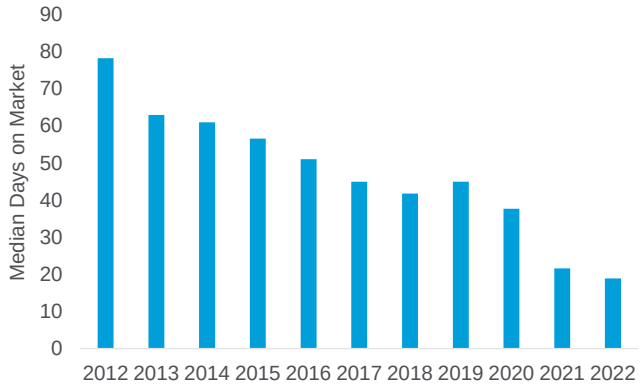
Two key trends are in place that drive innovation in the U.S. housing market. Although generally thought of as a mature asset class, innovation opportunities in housing market continue to exist in the post-Global Financial Crisis (post-GFC) period, with innovation potentially accelerating in the wake of the COVID-19 pandemic.

The first trend is simple supply and demand — tight supply and growing demand. Inventory for sale on the market has been on steady decline for many years, meaning buyers must act fast when they find a home to purchase. PropTech (i.e., fintech in real estate) can create efficiencies in the market to help the process. Figure 3 shows declining inventory of homes for sale versus (until recently) rising existing home sales (EHS). Dwindling supply and robust demand can give a technology innovator comfort that the housing market — the primary asset in all their investment models — will not sell off dramatically in the medium term.

Figure 3. Supply/Demand Dynamics Indicate Persistence

Source: National Association of Realtors, Citi Research

Figure 4. "Time to Sell" Has Significantly Compressed



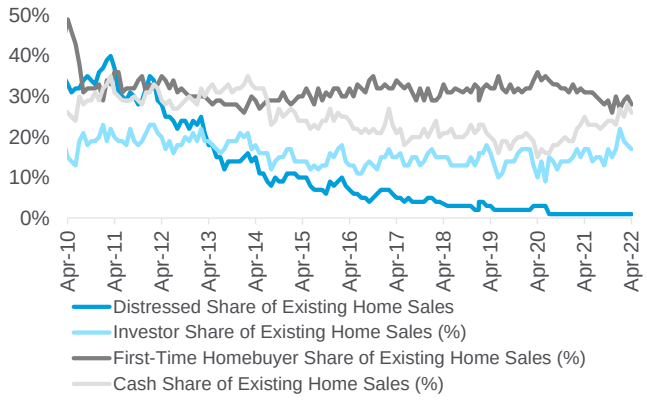
Source: Redfin, Citi Research

The second post-GFC trend is the rise of institutional investment in the U.S. housing market. Many foreclosures that occurred because of the GFC made their way into the hands of large, institutional investors who developed rental businesses in the post-GFC years. In addition, many other institutions have since entered the space due to its characteristics as a stable, long duration, cash-flowing asset that continues to yield a positive spread (Figure 8).

In the more operational parts of housing finance, we continue to see technology developments in operations such as title insurance, mortgage underwriting, and many other areas.

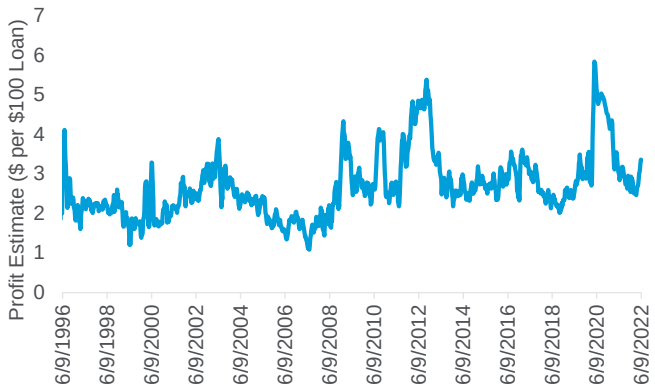
Make No Mistake, Some System Frictions Can Be Good: A home purchase or transaction involving housing is likely the single largest financial transaction most people will undertake in their lifetimes and generally has a breakeven investment period on the order of years. It also represents the bulk of their savings and wealth. Many of the processes and regulatory hurdles that exist today were developed as a series of consumer protections. In short, it is important that emerging business models respect and work with these protections, and not upend them completely.

Figure 5. Distressed Sales All but Gone, Cash, Investor Purchases Are on the Rise, and First Time Buyers Are Slowing



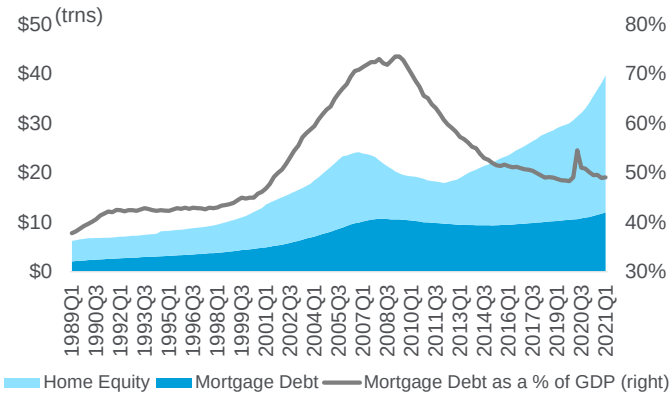
Source: National Association of Realtors, Citi Research

Figure 6. Loan Origination Profitability Was Significant During the Pandemic Thanks to Quantitative Easing But Is Now Back to Average



Source: Federal Reserve, Fannie Mae, Bloomberg, Citi Research

Figure 7. Equity in Real Estate Is Now ~69%, Up From ~46% in Q1 2012



Source: Federal Reserve, Citi Research

Figure 8. Rental Yield Spreads Remain Positive Post-GFC

Source: National Association of Realtors, U.S. Census Bureau, Bloomberg, Citi Research

In the remainder of the report, we take a closer look at some of the innovations currently making inroads into the housing market. We split these innovations into two general categories:

- **PropTech making the real estate transaction more efficient:** New PropTech solutions such as home equity investment (HEI) contracts, which help cash flow constrained homebuyers purchase a home; and iBuyers who act as market makers in the sale and purchase of a home, are making it easier to buy and sell a home. Innovation in transaction processes, such as title insurance and home appraisals, is speeding up the completion time of real estate transactions. On the mortgage origination front, technology and process improvements have been identified by newer, digitally-focused players to make the process more streamlined. And new technologies such as blockchain, cryptocurrency, and digital land in the Metaverse are emerging, with potential to transform the traditional real estate market.
- **PropTech making real estate management more efficient:** Institutional owners, who entered the single-family rental market post the GFC, have driven the use of technology in property management to generate operational efficiencies.

Home Equity Investment (HEI) Contracts

The idea of approaching household finance like corporate finance and proposing new “equity” products to replace financing traditionally obtained through debt, is not new. In particular, the idea of college students selling claims on future income as a partial or total replacement for student debt has floated around for as long as tuition costs have been spiraling upward. In housing, an analogous financial product that has been stirring for several years is the idea of home equity co-investment. In its most basic form, home equity co-investment is a transaction where the co-investor supplies a portion of the cash for a down payment (or portion of home equity) in exchange for a claim on a portion of the future price appreciation of the home.

To be clear, home equity co-investment is not truly an equity product. Though not really a legal term, “equity” in this setting is an accounting construct for the value of owned assets net of any liabilities against those assets. A home equity co-investor is not truly a partial owner of the home; they are not on the title, and are not even entitled to an opinion on color swatches (there are limitations in some cases depending on which company one examines). A more accurate description, in our view, is that home equity co-investment is a form of structured debt with a lien on a property that seeks to borrow two key traits from common stock in corporate finance: (1) less cash-flow burden than debt, and (2) value more closely tied to the upside/downside profile of the underlying assets.

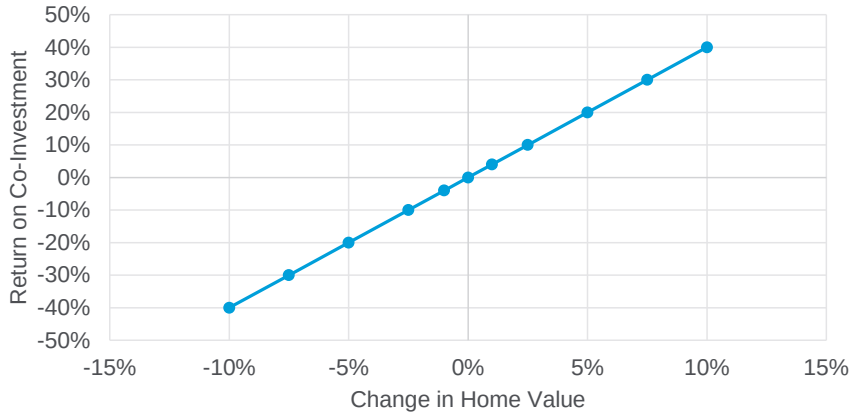
Double-Digit Potential Investment Returns

A stylized, typical home equity co-investment transaction might proceed as follows:

- A borrower is interested in purchasing a $300,000 home, and is willing to put down $30,000 as a down payment.
- Rather than taking out a 90% loan-to-value (LTV) mortgage, the borrower opts to accept $30,000 from a co-investor, and funds the remaining $240,000 with a traditional 80% LTV mortgage.
- The borrower makes no regularly scheduled payments to the co-investor. But, in the event the borrower sells the home, the co-investor is entitled to their initial $30,000 investment plus/minus 40% of the change in value between the initial purchase price and the ultimate sale price. For example, if the borrower sells the home for $400,000 subsequently, the co-investor would be entitled to $70,000 from the sale proceeds — a 133% return on the co-investor’s investment.
- From the borrower’s perspective, this offers the advantage of capital access that does not encumber their income cash flow. But this certainly is not without cost: while a high loan-to-value (LTV) loan might add an effective 1%-3% in interest payment/mortgage insurance, the proceeds of a sale would be over $130,000 versus around $60,000 in the equity co-investment scenario. In other words, in exchange for cash flow flexibility and less liability to the downside, the homeowner concedes meaningful upside potential in building wealth.

As is clear from the example transaction’s description and Figure 9, from an investor perspective this amounts to a 4x levered bet on home price appreciation — thereby turning the relatively soft home price appreciation (HPA) level of 2.5% into the threshold for double-digit returns.

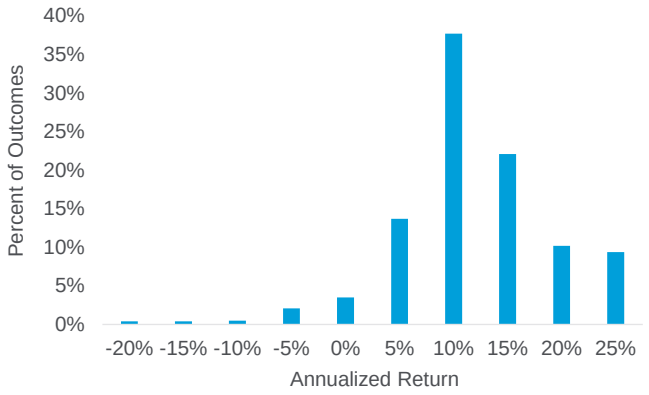
Figure 9. Approximate Payoff Diagram for Home Equity Co-Investment Transaction Example



Source: Citi Research

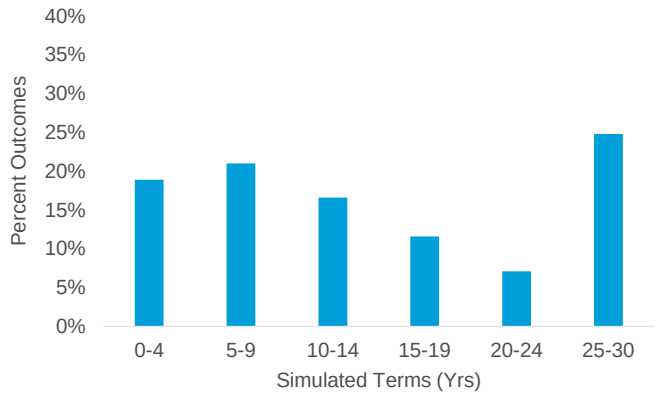
Taking the investment analysis a step further, we built an autoregressive model of the S&P/Case-Shiller U.S. National Home Price Index going back over 30 years. (leaving the recent housing market strength to the side for now). Using the regression parameters to simulate home price movements, we constructed a Monte Carlo simulation of home equity co-investment performance where the probability a home is sold at a given point is determined by the prepayment speed assumption (PSA) curve. We reference the standard model, known as 100% PSA or 100 PSA as a simple approximation of housing turnover (~6% per year). We show the distribution of returns and the length of the payback period in Figure 10 and Figure 11, respectively.

Figure 10. Expected Annualized Return ~10%



Source: S&P Case-Shiller, Citi Research

Figure 11. Median Payback Period Term Is ~15 Years Based on Turnover Prepay Ramp



Source: S&P Case-Shiller, Citi Research

Overall, the results of the simulation are encouraging. Only 3.4% of the simulation paths had negative annual returns, while roughly 20% had annual returns of 20% or more. The average annualized return was ~10% and the investment term was roughly in line with the PSA curve pay-down. Given this expected level of return, these contracts could trade at a premium in the secondary market. We would also not be surprised to see the development of securitization finance pools of contracts in the future.

That said, this investment profile may have some drawbacks when compared to just taking a relatively liquid, low single-digit-yielding financial asset and levering it 4x instead. First, compared to putting on a 4x levered treasury trade or something similar, there is a comparatively large operational burden of monitoring the owner-occupant to ensure timely payment of taxes/senior debt as well as property maintenance, agreeing to value added by borrower improvements, and proceeding with legal action in the event of non-compliance. Perhaps this added operational burden is the cost of ensuring a much more stable value asset compared to a levered treasury trade.

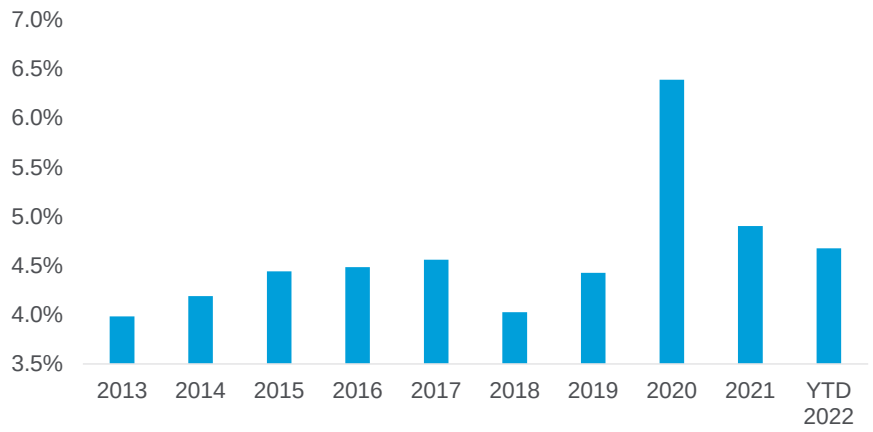
Second, and in a similar vein, the investment is not a pure levered HPA exposure per se, because performance is closely tied to housing needs and the credit health of the borrower. This could end up being beneficial — underwater borrowers staying put rather than selling at a loss, for example, is a relatively common, return-enhancing scenario. However, it does require an additional layer of analysis. The continued democratization of information and data in housing will help this business model.

Lastly, though the repayment structures may be a radical departure from traditional mortgages, it could be prudent to view these transactions as loans secured by residential real property unless applicable regulators have demonstrably indicated otherwise. In this admittedly conservative view, home equity co-investment could carry the same compliance and regulatory exposure as regular mortgages. But this is not our expertise, we will leave that for the lawyers and regulators to figure out.

Housing Turnover Is a Key Driver

The underlying turnover of a given housing stock can be a key driver of HEI contracts since most returns are monetized when a home is traded. In our example above, we used a seasoning ramp to a 6% CPR (Constant Prepayment Rate) over 30 months, but more recent data suggests that turnover has been generally lower over the past few years (see Figure 12). If we look at the recent low turnover print in 2018 on a regional basis for the U.S., it is notable that areas in the Southeast and West were generally protected from the higher rate environment. Other key drivers to keep an eye on are general economic factors like job growth, migration patterns, and rent versus own metrics.

Figure 12. Housing Turnover Shifts Over Time (% of Total per Year)



Source: National Association of Realtors, U.S. Census Bureau, Citi Research

There are certainly strong factors that support the growth of shared appreciation home equity contracts. The potential total addressable market could be in the trillions of dollars and there are supportive structural nuances, including the fact that home equity loan interest is no longer deductible on personal income taxes. Even if this is not destined to become a universal feature of a home purchase, it could still play a meaningful role in more targeted applications. In our example above, the hypothetical borrower would have a lower mortgage payment and avoid paying mortgage insurance (PMI) by obtaining the co-investor. If this borrower were seeking to use that savings to improve the property, the home equity co-investment transaction could be mutually beneficial and offer enhanced investment returns.

iBuyers: Scale Before Stability?

Homeownership is culturally and economically ingrained in American life. With abundant access to long-term, stable financing and numerous tax benefits, the majority of American households today — 65.4% in the second quarter of 2021, according to data from the U.S. Census Bureau — own their own home. This has been the case for generations and for many of these households, the accumulated wealth of homeownership remains the bedrock of upward economic mobility. In the most recent Federal Reserve Survey of Consumer Finances (2019), the median homeowner had a net wealth of $255,000, of which $120,000 — nearly half — is attributable to home equity.

In addition to being the largest concentrated form of wealth for the typical homeowner, a house can be distinguished from other assets in that the owner occupant is dependent on it to satisfy one of the four basic needs: shelter. Taken together, the large concentration of wealth and necessity of shelter mean that a homeowner looking to move cannot typically afford to purchase a new home without the sale proceeds of their existing home. At the same time, they cannot sell their current home without an alternative place to live. This basic constraint can make the moving process logistically complicated and frequently expensive. One group of PropTech firms, known as iBuyers, think they can simplify the process.

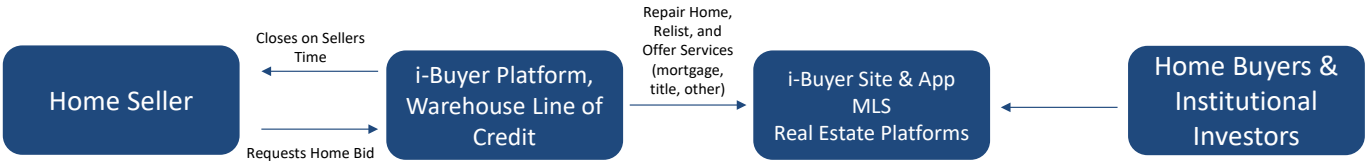
What Is an iBuyer?

The process of buying or selling a home has remained stubbornly status quo. A homeowner wishing to sell their home must identify those who desire to live in their particular home at that particular time. Outside of periods with hot market conditions, the process usually takes 30-90 days. This time is filled with inconvenience and uncertainty, often ensnares as many as half a dozen third parties, and can often cost the seller 3%-6% of the sale proceeds in broker commission along with other transaction expenses.

In contrast, the iBuyer business model is similar to that of any market maker — buying homes from those wishing to sell and selling homes to those wishing to buy, while generating revenue through the bid-ask spread between the two. In a market dominated by brokers, the iBuyer firms are attempting to be dealers.

It is easy to see the appeal. Imagine you are interested in moving. You go online and get an instant offer to buy your home from an iBuyer. You then browse through their inventory of vacant, move-in ready homes, and by utilizing a smartphone enabled lock-box you are able to visit the ones that interest you as many times as you like. When you settle on one, the iBuyer allows you to do a “trade-in” of your current home for the new one — simultaneously arranging financing, insurance, and even furniture movers. In fact, over the past few years we have witnessed the development of relationships between homebuyers and home builders to help buyers trade up to a new construction home. And if, after staying there a week, you discover the sounds of a nearby highway are bothering you, the iBuyer lets you undo the trade-in. Such a process is driven by the customer’s timetable and could ease many of the common pain points associated with residential real estate transactions.

Figure 13. The iBuyer Business Model



Source: Citi Research

Within this market-maker strategy, the iBuyer has several levers to manage profitability, all of which are highly dependent on the success of accurate and insightful modeling:

- **Offer Pricing:** The purchase price offered to home sellers is naturally the most impactful variable for profitability, and the business model is tuned to make markets at fair value. In other words, the strategy is designed for purchase and resale at roughly constant price levels. Rather than purchasing at a slight discount and reselling at a slight premium like a financial market maker, an iBuyer charges a service fee, which is a percentage of the purchase price and withheld from the ultimate proceeds. Historically this fee has been around 7% and as high as 14%. The level is model-determined based on perceived risk and a target return level. More recently, service fees have compressed to around 5%, making them competitive with the fees charged by the traditional real estate brokers employed by roughly 90% of home sellers.

- **Renovation and Holding Cost Management:** Similar to the service fee, the iBuyer also negotiates the withholding of funds to cover any necessary repairs. Separately, the iBuyer may also invest in renovations their models indicate could be accretive to home value. Naturally, the more renovations undertaken, the longer the delay until the home is put back on the market for resale. Similarly, the higher the re-offer price the longer the home is expected to remain on the market. Holding a home in inventory naturally incurs holding costs in the form of property tax and interest expense, and the tradeoff between holding cost and price upside must be taken into consideration.

- **Ancillary Services:** Potentially the ultimate driver of profitability in the space could come from folding in higher margin, adjacent, commoditized services. The initial push into such services came from offering title insurance to the home purchaser, with some iBuyers seeing adoption rates for such services as high as 80%. Mortgage lending, moving, and similar logistic and financial services also appear to demonstrate high potential. Furthermore, we note that many iBuyers are offering a hybrid model, whereby home sellers have the option of utilizing their platform to renovate and market their home to end sellers. Such a model eliminates much of the operating cost associated with iBuying, while preserving much of the revenue.

Growing Pains

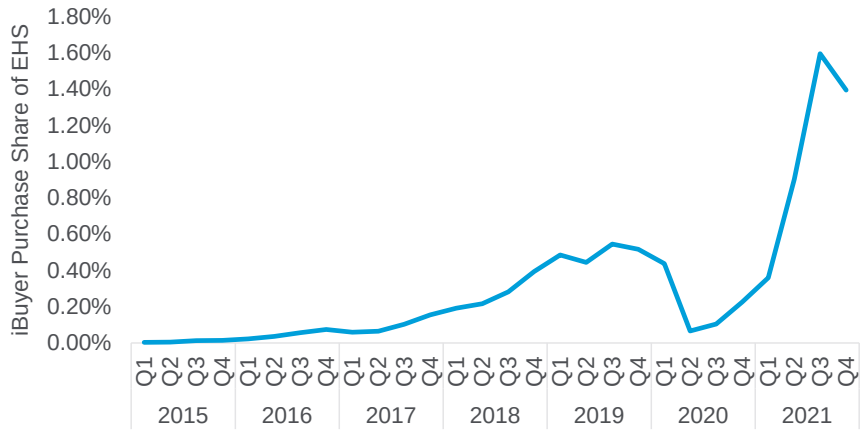
iBuyers overall have experienced a tremendous amount of growth — after some setbacks early in the pandemic, iBuyer purchase volume surged to ~1.2% of all home purchases in 2021, and trended above 1.5% in the third quarter of 2021 (see Figure 14). Given typical iBuyer turnarounds are 70-100 days on the resale, this implies the steady state of iBuyer activity in overall home sales (buying and selling) is north of 3%. In some of the most active markets, typically located across the Sun Belt (i.e., the southern U.S.), iBuyers were behind more than 1 in 10 purchases in the second half of 2021, based on analysis of iBuyer data.

Empirical evidence seems to suggest consumer needs are well addressed given conversion rates of nearly a third at some iBuyers and high customer satisfaction metrics.[2]

However, the growth in iBuyer volume has not been entirely a blessing — as one iBuying executive put it, "Buying houses is the easy part." Against a backdrop of one of the hottest housing markets in recent history, iBuyers have had to become increasingly aggressive with their bidding prices in order to stay competitive. As a result, the markup of homes at resale has meaningfully compressed to around 1%, with a growing tail of homes resold below the purchase price. As a consequence, one of the largest and most aggressive iBuyers announced their permanent cessation of operations in October 2021 after taking significant write-downs on their inventory.

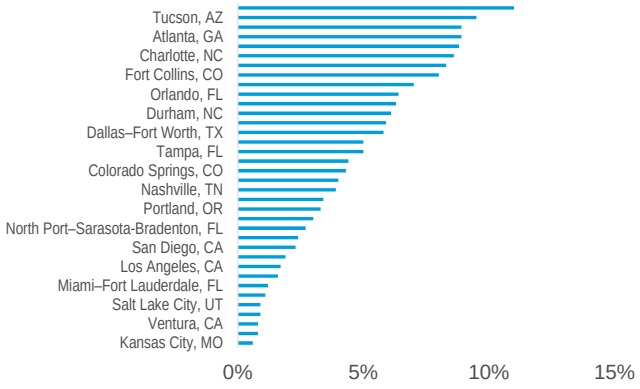
The remaining iBuyers, whose purchase activity constitutes about 0.5% of all home sales, appear to have underwritten purchases more conservatively and benefited from the strength of the housing market, with net profit margins nearly doubling.

Figure 14. iBuying Participation Is Now Well Established



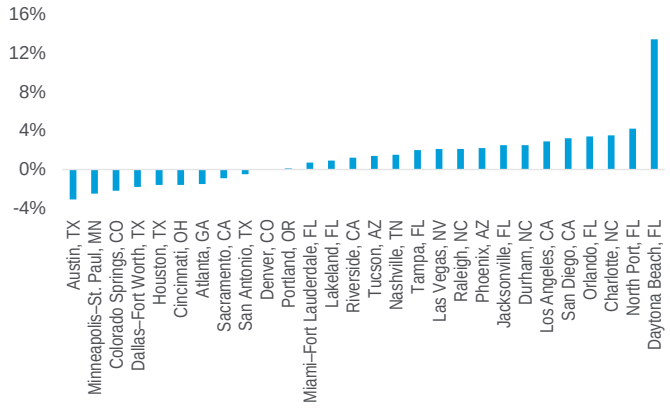
Source: Redfin, Citi Research Note: EHS = Existing Home Sales

Figure 15. iBuyer 4Q21 Market Share in Top Markets (4Q 2021)



Source: Company filings, Citi Research

Figure 16. Median iBuyer Markup by Market (4Q 2021)



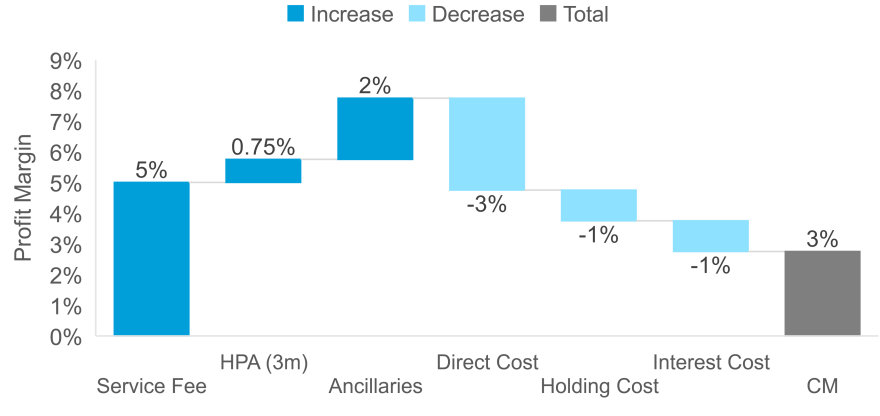
Source: DBRS/Morningstar, Citi Research

[2] Sourced from analysis of iBuyer public filings.

Making the Economics Work

Despite some of the headline grabbing turbulence, we believe the iBuyer business model is workable even in relatively conservative scenarios. In Figure 17, using a 5% service fee, 3% annual home price appreciation (HPA), a three-month turnaround, and expenses consistent with current values, we estimate contribution margin, or the selling price per unit minus the variable cost per unit, remains in positive territory even without the inclusion of any ancillary services.

Figure 17. Conservative Market Conditions Could Produce Positive Contribution Margin (CM)

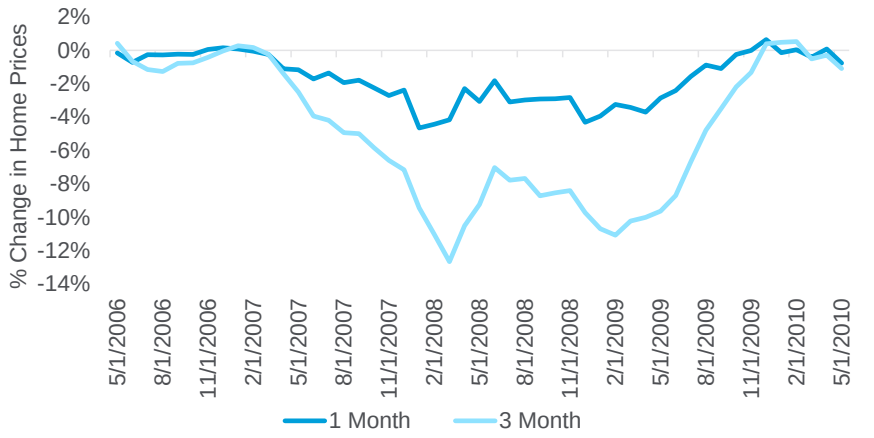


Source: Citi Research

We also believe that an iBuyer could weather a sudden surprise downturn, given the generally slow-moving nature of home prices. As a historical worst-case scenario, we look at one-month and three-month HPA during the financial crisis in Las Vegas (Figure 18). If an iBuyer in this environment ignored all other market signals and continued to purchase homes while the market was still more or less moving sideways in the first quarter of 2007, the home price index implies they would have sold their inventory 2%-3% below the acquisition price. Though obviously not ideal, this nevertheless could remain manageable.

In short, the iBuyer model addresses major pain points in the home purchase process, certainly in terms of time and logistics, but increasingly towards a process that is cost neutral. It is rare to see potential “better mousetraps” of this nature in mature industries like housing, and though it is certainly capital intensive, the strategic positioning of this strategy is supportive of continued growth — even in constrained capital availability.

Figure 18. Changes in Las Vegas Home Prices During the Financial Crisis



Source: S&P Case-Shiller, Citi Research

Mortgage Technology

With lax underwriting within the mortgage industry playing a part in the Global Financial Crisis (GFC), Congress passed the Dodd-Frank Act in 2010, leading to significantly tighter underwriting and most mortgages going through government-sponsored enterprises (GSEs — Fannie Mae and Freddie Mac), the Federal Housing Administration (FHA), and the Department of Veterans Affairs (VA). As regulations and capital requirements increased for banks, they reduced focus on mortgages and opened up entrance opportunities for non-bank lenders. Notably, because of improved technologies and marketing efforts of new lenders, some of the fastest growing mortgage originators are digital-first lenders with 100% end-to-end digital underwriting processes. Consumers can now receive purchase approvals on their phones via mobile apps and complete the entire purchase or refinancing process without physically signing a paper document.

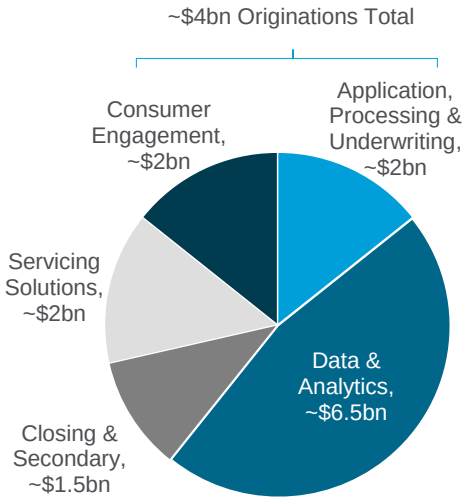
Technology and process improvements have been identified by newer, digitally-focused mortgage originators and software providers that make the process more streamlined similar to the advent of an assembly line for cars. Instead of having a single mortgage loan processor seeing the mortgage through each step, these companies have specialized roles (e.g., appraisals, income verification, etc.) and each role can work on the same loan simultaneously. This leads to faster loan closings and increased scalability during times when mortgage demand spikes (e.g., lower interest rate environments). The specialized roles also shorten the training time for new hires versus the 6-12 month training required for a traditional single loan processor. These improvements have led to an increase in loans per team member processed per month at the leading digital mortgage originator of 2x-3x.

Sizing the Market Opportunity

The U.S. mortgage market is huge, averaging over $2 trillion per year over the past 18 years and can sometimes reach $3 trillion to $4 trillion when refinancing opportunities are present as interest rates decline. The biggest revenue pools for mortgage production stem from the sale of the loan (typically to government entities) to pool them for investors into mortgage-backed securities (MBS). Since an agency MBS comes either with an explicit (FHA and VA loans) or implicit (GSE loans) guarantee, investors pay a premium for the expected interest on the loans. These gains make up the bulk of revenue for mortgage originators. For example, a $300,000 mortgage creates around a 4% gain on sale for a retail originator (including a non-cash creation of a mortgage servicing right). However, the technology developed to help make mortgage underwriting more efficient provides additional cost savings for originators primarily through labor costs (less people to pay in processing a mortgage), closing loans more quickly (less hedging costs), and processing more loans per month (additional revenue opportunity).

We think mortgage technology mostly addresses current inefficiencies in the underwriting process. Below we address the total addressable markets (TAMs) as they relate to mortgage technology, a subset of the larger overall mortgage TAM. We begin by thinking through a sustainable annual mortgage production level and relate it to the $14 billion TAM estimated by industry participants.

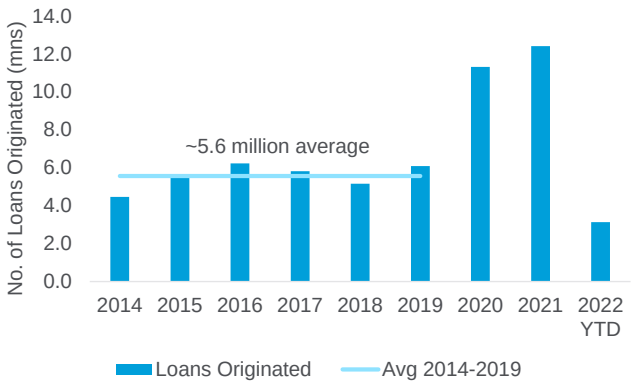
Figure 19. Mortgage Origination and Adjacent Industries Represent a ~$14 Billion Mortgage Tech TAM



Source: Company Reports, Citi Research

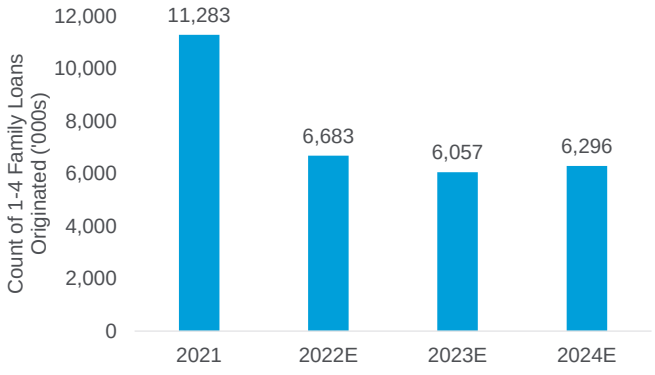
To begin our evaluation of mortgage tech TAMs, we thought it more relevant to focus on loan production rather than total nominal assets as we view the revenue opportunity as coming mainly from lowering the cost of production per loan and receiving a portion of that lowered cost as revenue. Looking at single-family loan production statistics, the average number of loan products leading up to the pandemic was 5.6 million loans per year; we exclude the outsized refinancing year of 2020 (Figure 20). Further, we assume the decline projected by the Mortgage Bankers Association (MBA) for 2022 and beyond, which brings the estimated level of loan production back down to slightly above the 2014-19 average.

Figure 20. Single-Family Loan Count Averaged ~5.6m from 2014-19



Source: Fannie Mae, Freddie Mac, Ginnie Mae, CoreLogic, 1010data, Citi Research

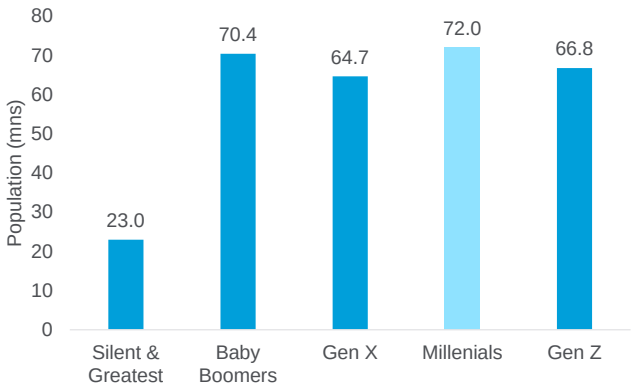
Figure 21. Estimated Mortgage Originations in 2022 Back to Average Based on MBA Forecast



Source: Mortgage Bankers Association, Citi Research

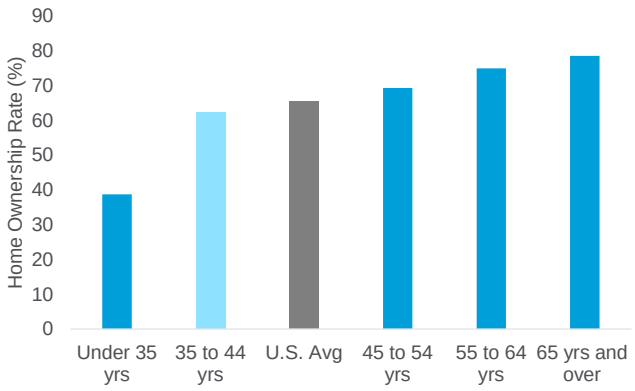
Looking at demographics, we believe the rate of home buying by Millennials in the coming years could prove the pre-pandemic ~5.6 million run rate on single-family loans conservative, given the size of the cohort and their sub-average homeownership rates, which may revert to historical averages.

Figure 22. U.S. Population by Generation Cohorts (2020)



Source: U.S. Census Bureau, Citi Research

Figure 23. Home Ownership by Age Cohort (1Q 2022)



Source: U.S. Census Bureau, Citi Research

The Mortgage Bankers Association projects a -4% decline in new home sales in 2022, followed by ~5% growth in 2023.

Figure 24. Home Sales Expected to Decelerate in 2022

	2015	2016	2017	2018	2019	2020	2021	2022E	2023E	2024E
New Homes, in mil	0.50	0.56	0.62	0.61	0.68	0.83	0.77	0.77	0.82	0.83
% YoY		12%	10%	0%	11%	22%	-7%	0%	6%	1%
Existing Homes, in mil	5.25	5.45	5.51	5.34	5.34	5.64	6.12	5.76	5.87	6.08
% YoY		4%	1%	-3%	0%	6%	9%	-6%	2%	4%
Total Homes, New + Existing	5.753	6.011	6.125	5.954	6.023	6.471	6.889	6.531	6.685	6.903
% YoY		4%	2%	-3%	1%	7%	6%	-5%	2%	3%

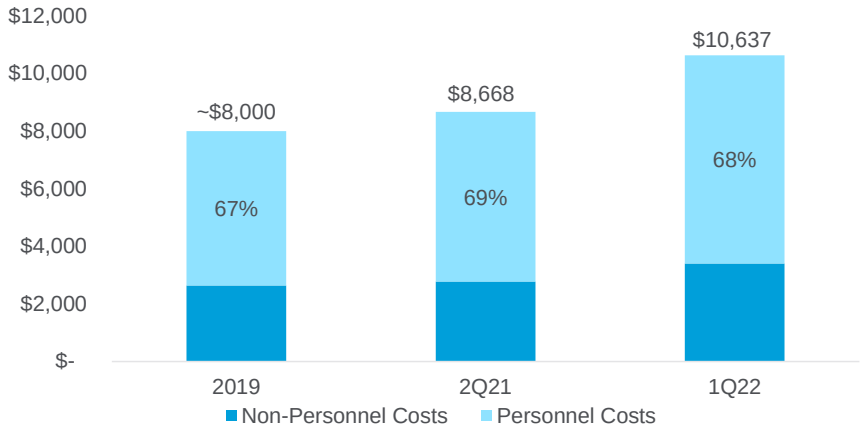
Source: Haver Analytics, Mortgage Bankers Association

Thinking through the mortgage originations technology TAM, we start our analysis using our ~5.6 million mortgage production level run rate, then estimate overall costs to originate a loan, highlighting a MarketWise study conducted in 2018, which assesses savings and return on investment for lenders from adopting mortgage tech solutions. The MarketWise study concluded adopting mortgage tech (provided by one specific industry participant) generated savings of $813 per loan with an additional $369 of revenue generated from ancillary solutions, for a total savings of $1,182. Additional quantifiable benefits from the study included: (1) a 23.5-hour time reduction in loan origination and manufacturing, (2) an increase in the net income margin of clients to 10% from roughly flat, (3) year-over-year expected loan origination growth of ~11% versus a range of -2% to +2% for the industry, (4) and an annual return on investment from mortgage tech investment of 698% with a breakeven of ~2 months.

Applying our ~5.6 million mortgage production level to the $1,182 estimate of savings identified in the MarketWise study, we arrive at ~$6.6 billion in potential cost savings versus the $4 billion TAM. On top of cost savings, we believe an increase in the number of service providers on mortgage tech platforms, new product introductions, and the potential for bundled pricing will lead to an increase in the overall revenue opportunity and is well-aligned with the trend of vendor/platform consolidation we are seeing across the broader mortgage origination universe.

Turning to the $4 billion data and analytics TAM, in 2019 it cost roughly $8,000 to originate a loan, and there is a potential $2,600+ per loan of targeted customer savings from mortgage tech. Turning back to our ~5.6 million sustainable annual loan production estimate, this suggests a total savings potential of ~$14.6 billion. Additionally, we note that in the first quarter of 2022, the cost to originate a loan increased to $10,637. Applying the same 32.5% proportion of potential savings as in 2021 suggests ~$3,500 of potential savings per loan. Given personnel costs in the first quarter of 2022 made up approximately two-thirds of total origination costs, we find the increase in potential savings a reasonable estimate.

Figure 25. ~$10,000+ Cost to Originate and Personnel Costs ~2/3 of Overall Cost



Source: Company Reports, Mortgage Bankers Association, Citi Research

Looking to the Future of Mortgage Tech

While several large lenders have hastened closing times by automating their processes, many new entrants are further pushing the current limits of time and cost. Several models offer services where customers are able to submit a loan request online, share documents digitally and securely with the bank, and track the status of their loan from application through closing. Others are applying artificial intelligence to request common documents and employ systems that connect source-verified data, reduce timelines, and give lenders a chance to win more customers. Others still, offer digital applications and guided workflows, making it easy for customers to understand the process and connect their data, and produce an accurate file to help close more loans faster. The one big theme in most mortgage PropTech is automation for both the consumer and institution, removing manual, error-prone tasks and replacing them with machine learning to reduce processing steps and streamline follow-ups.

Title Insurance and Other Process Tech

Part of the home buying process that appears ripe for disruption involves a process that runs in the background — title insurance. Many of us never realize who verifies the ownership of a property we plan to buy. Why does title insurance cost so much given the large amount of historical ownership data available, and why does it take so long? Addressing title insurance could help shave down the time required to purchase the Home of the Future to days rather than weeks.

Real estate technology companies are now aiming to streamline various aspects of a real estate transaction. Several are seeking out a process that transforms the title insurance search to nearly instant from three to five days. For about 80% of refinance orders, companies have the ability to provide instant underwriting using title and property data in combination with proprietary machine learning algorithms. As a result, they can offer lower policy premiums.

Escrow and closing services are also seeing disruption. Combined into a technology platform, companies can drive a 15%-25% faster closing timeframe compared to the more typical 30-50 days. The goal is to drive order rates higher, largely driven by the speed of process. They are also bundling in other ancillary services such as home warranties and appraisals.

Large Total Addressable Market

To size the broader title insurance opportunity, we look at total home sales, new housing completions, and mortgage refinancing activity in the U.S.; these are instances where title insurance, escrow, and closings are generally required. Accordingly, we expect around eight to nine million transactions to occur annually that require these processes. More recently, the industry benefited from increased mortgage refinancing activity, driving total instances to nearly 15 million in 2020 down to an expected 9.4 million in 2022. We estimate the total addressable market (TAM) for title insurance, escrow, and closing to be ~$19 billion going forward. Figure 26 highlights the market opportunity and the market potential that title insurance provides.

Figure 26. The Total Market for Title Insurance Should Run ~$19 Billion in the Near Term

	2019	2020	2021	2022E	2023E	2024E
Total Existing Home Sales (single + multifamily, in mil)	5.45	6.53	6.13	5.93	6.06	6.28
+ Housing Completions (single + multifamily, in mil)	1.26	1.29	1.34	1.15	1.20	1.30
+ Total U.S. Refinance Mortgage Originations	3.39	7.13	2.35	2.27	1.72	1.84
= Total U.S. Instances for Title , Escrow, and Closing	10.10	14.95	9.81	9.35	8.98	9.42
x Average Cost of U.S. Title Insurance, Closing, and Escrow ($)	2,000	2,000	2,000	2,000	2,000	2,000
= U.S. Title, Escrow, and Closing TAM ($ mil)	20,200	29,900	19,626	18,706	17,962	18,840

Source: U.S. Census Bureau, National Association of Realtors, Haver Analytics, Citi Research

Adjacent Opportunities

While many title insurance providers are largely focused on addressing title insurance, escrow, and closing, others have pointed to the highly fragmented market of appraisals as a natural segment to tackle in the future. As title insurance providers engage in appraisal services, we see the addressable market expanding back to ~$3 billion to $5 billion over the next decade.

Figure 27. We Estimate the U.S. Home Appraisal TAM to Be ~$3 billion to $5 billion

	2017	2018	2019	2020	2021	2022E	2023E	2024E
Total U.S. Purchase Mortgage Originations (in mil)	4.25	4.26	4.39	4.86	4.88	4.48	4.41	4.49
+Total U.S. Refinance Mortgage Originations (in mil)	2.52	1.94	3.39	7.13	6.41	2.27	1.72	1.84
= Total U.S. Originations	6.77	6.20	7.78	11.99	11.28	6.75	6.13	6.33
x Average Cost of U.S. Home Appraisal ($)	500	500	500	500	500	500	500	500
=U.S. Home Appraisal TAM ($ mil)	3,385	3,100	3,890	5,995	5,642	3,373	3,066	3,166

Source: Mortgage Bankers Association, Citi Research

At the same time, home warranty services also present an attractive next step in expansion for many title insurance providers (though many major title companies already compete in this segment). We estimate the TAM to be ~$2 billion.

Figure 28. We Estimate the U.S. Home Warranty TAM to Be ~$2 Billion

	2017	2018	2019	2020	2021	2022E	2023E	2024E
Total U.S. Purchase Mortgage Originations (in mil)	4.25	4.26	4.39	4.86	4.88	4.48	4.41	4.49
x Average Cost of U.S. Home Warranty	450	450	450	450	450	450	450	450
= U.S. Home Warranty TAM	1,913	1,917	1,976	2,187	2,194	2,016	1,984	2,022

Source: Mortgage Bankers Association, Consumer Financial Protection Bureau, Citi Research

Incumbents Have Majority of the Market Share Today

Historically, leading incumbents in the title insurance market have had an 80%-90% market share. Accordingly, there is risk that digital title providers may run into challenges taking share from these top players. Generally, disruptive companies help drive change by bringing leading technology to highly fragmented industries that are difficult to consolidate and subsequently drive consolidation. We believe digital title providers can add much-needed efficiency and speed to an otherwise antiquated business and process; however, it is still too early to determine whether they can successfully disrupt the status quo with this value addition.

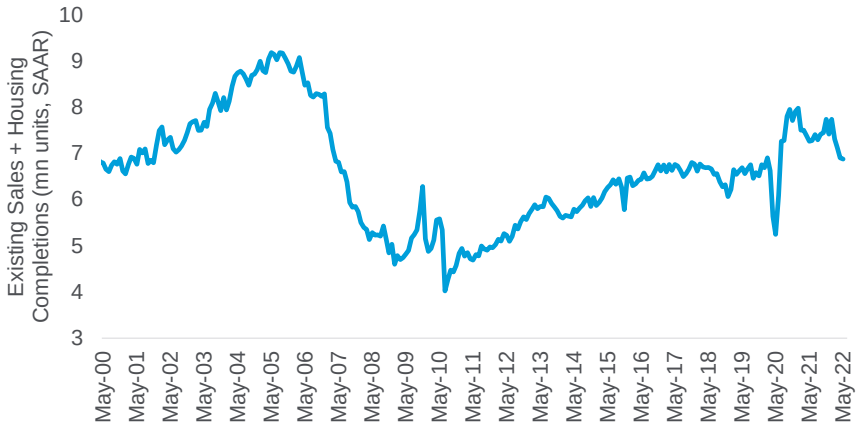
Speed and Lower Costs Likely to Drive Disruption

Title insurance is not generally a focal point for a buyer, seller, or refinancing homeowner. Instead, the real estate agents and brokers, mortgage lenders and brokers, or lawyers choose it, depending on which state the transaction occurs. Accordingly, we believe it may be more challenging to win over some of the small independent brokers and agents since the title process is not a key pain point for them in terms of the speed to closing transactions. However, mortgage lenders may see the benefit in moving through the title process more quickly, enabling fewer employees to process more mortgages. Additionally, iBuyers are offering discounted title insurance fees to homebuyers because they are negotiating in bulk.

Other Considerations

Other notable considerations for the digital title insurance industry include: (1) digital title companies have predominately participated in refinancing transactions, which we view as somewhat easier title insurance policies to underwrite — 2020 and 2021 saw record levels of mortgage refinancing activity, which is likely to revert as interest rates increase; (2) as interest rates increase and the housing market cools off, there may be substantially less real estate activity as fewer home transactions occur; (3) digital title insurance providers may face risk from large and profitable incumbents making investments in similar technology; and (4) an economic downturn could also pressure the broader housing market, challenging the industry's ability to grow and win market share.

Figure 29. Total U.S. Existing Home Sales and Housing Completions (millions, seasonally adjusted annual rate)



Source: U.S. Census Bureau, Haver Analytics, National Association of Realtors, Citi Research

Other PropTech Strategies

While the highlighted innovations are some of the larger standouts in real estate PropTech, many others exist. Below are only some of the standout strategies:

- **Streamlined, Pre-Cleared Purchasing:** Many models exist around streamlining the home purchase process. For example, some businesses will execute a cash purchase of a home for a borrower while they complete the remainder of mortgage underwriting. This may be valuable in a "hot" housing market where homes trade quickly.
- **Online Exchanges:** Since the Global Financial Crisis (GFC), we have seen the development of electronic exchanges by which investors can buy and sell properties.
- **Rent-to-Own Versus Sale/Leaseback:** There are a wide range of strategies looking to profitably streamline the transition to and from home ownership. Many marketplaces and business strategies aim to monetize the future trend of Baby Boomers downsizing and Millennials buying. Businesses that help borrowers transition to ownership are set up to present renters with options to buy the home they are in or purchase portions of equity over time. Other businesses purchase homes and then lease to the seller while they figure out their plans to transition to their next life stage.
- **Blockchain Information/Transactions/Loan Management:** Thousands of municipalities maintain records of real estate transactions. Several companies are looking to disrupt the legacy transfer of knowledge by digitizing information and developing ways to interact with records securely. This could be especially useful for title insurance. Other companies are employing blockchain-based technologies to streamline the trading, servicing, monitoring, and securitization of loans.
- **Fractional Ownership/Tokenization:** Technology could re-architect the investment management industry, adding liquidity to asset classes like large, single real estate holdings. Various strategies look to "tokenize" (effectively securitize or crowdfund) single pieces of real estate through a private real estate investment trust (REIT) structure with the goal of enabling the secondary trading of assets that were previously unavailable to retail and small institutional investors.

With real estate being one of the most heavily regulated sectors of the economy and R&D spending by market participants historically limited, these strategies are only now taking a foothold. As we move towards a "frictionless" housing market, we should remember many frictions are in place for a reason. Shelter is a fundamental need, and the prospect of "disrupting" the housing market fills many with trepidation. Not all strategies should or will survive, but we do see potential for democratization and improvement of many legacy ways of doing business.

Blockchain in Real Estate

The advent of blockchain technology has brought to light significant inefficiencies in the way real estate business is conducted. Its formal adoption by the real estate community has the potential to fundamentally change the way in which transactions occur. The combined use of blockchain-based technology — such as non-fungible tokens (NFTs) and smart contracts — would increase transparency, reduce fraud, simplify transactions, and boost liquidity in the real estate market, among other benefits.

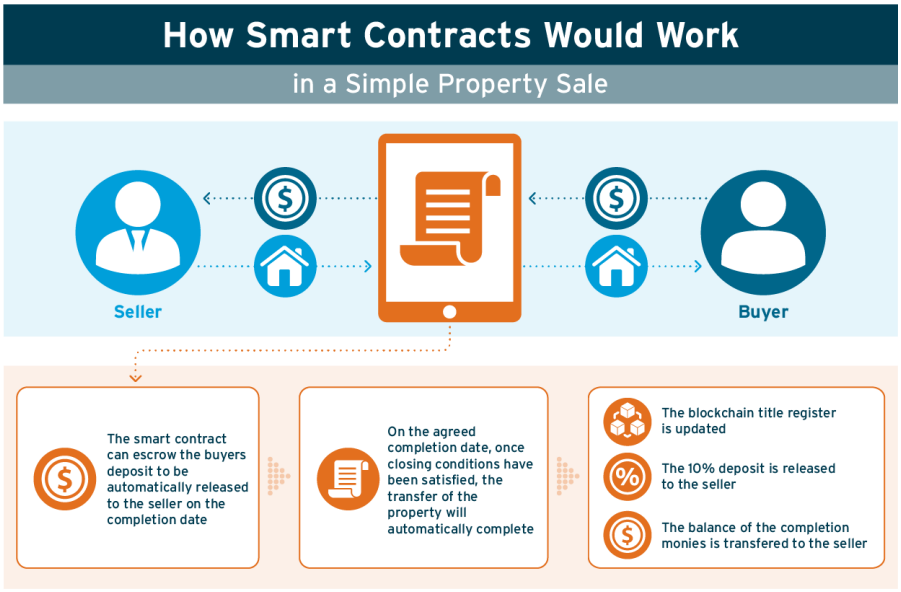
Historically, the real estate community has been slow to adopt radical new technologies largely due to the relatively expensive prices of individual assets (homes, buildings) and the sheer size of the market. As blockchain technology grows in popularity, is adopted by other industries, and becomes better understood by the general public, the benefits of shifting real estate activity onto the blockchain may become apparent and catalyze one of the largest paradigm shifts the industry has ever seen.

Blockchain technology provides a host of opportunities to streamline transactions; increase visibility to real estate buyers, sellers, and investors; and improve liquidity. Smart contracts would functionally circumvent the need for escrow, reducing transaction costs for all parties involved in the transaction. The tokenization of real estate assets would allow for fractional ownership, vastly improved liquidity, and increased supply chain visibility. Below we highlight potential areas for process improvement in the home construction and buying process.

Improving Efficiency in Construction: Homebuilders seldom conduct the full construction of homes in-house; instead, they enlist sub-contractors to manage labor, materials, and supply chain logistics. A blockchain platform would offer a host of opportunities to maximize efficiency in the home building process. Smart contracts — or blockchain-based programs designed to automatically execute once prerequisite conditions are met — could be a tool in this process. For example, blockchain technology enables a luxury homebuilder to ensure that a certain high-end grade of wood is used in the framing of a home. Once the wood is harvested, it is uploaded onto a blockchain as a non-fungible token (NFT) at the point of origin. The NFT becomes the digital equivalent to a manufacturer stamp of authenticity. Using a smart contract, the builder can include a conditional clause to contract execution; each square meter of wood used in the home must be registered as an NFT and is fully traceable to the point of origin. If the contractor fails to secure the necessary wood, the contract is void. If the blockchain can validate the authenticity of the wood, that specific stipulation of the contract will be satisfied, and any further clauses would need to be fulfilled before the contract is fully executed.

This process would vastly improve the historically nebulous lines-of-sight into the builder supply chain. Contractors in turn would enjoy powerful performance incentives and opportunities to publicly improve their reputation, as the blockchain will include the record of their successful completion of the job. Shareholders would also benefit, gaining increased visibility into company operations on a level of granularity never before conceivable.

Figure 30. Smart Contract Diagram



Source: Citi Research

Vastly Simplifying the Home Search Process Through Centralized Databases: Many prospective homebuyers begin their home buying journey with a simple web search, usually landing them on a real estate listing website. Current real estate listing websites give homeowners and brokers alike the ability to upload homes on the website at a specific list price while prospective sellers may opt to include other details like house specifications, zoning information, and school districts. This property search process is subject to significant inefficiencies. Today's sites require users to input data manually. If a seller's listing on one site does not include a certain parameter of interest to a buyer, it falls on the buyer to conduct their own due diligence to locate the information. Additionally, sellers or brokers typically list the same home on numerous sites to maximize exposure to prospective buyers. This has led to dated, fragmented, incomplete, and sometimes inaccurate data about the same home available across different sites.

A blockchain-based multiple listing service (MLS) functions similarly to today's listing sites but provides a centralized, reliable, and complete view of the residential real estate market. The concept of an MLS is not new; today's non-blockchain MLS options, however, are typically run by third parties, require expensive subscriptions, and do not guarantee the same level of reliability as a blockchain-based MLS. Through a blockchain-based MLS, information about a given home — including historical transactions, location, school districts, property taxes, physical properties, and zoning restrictions — are uploaded onto the block. Distributed ledger technology all but guarantees the accuracy of the data on the block. Once a block is added to the chain, it remains there permanently, practically eliminating data inaccuracies and preventing deliberate misrepresentation of a property by a seller.

As the blockchain grows to include more data, the dataset expands without the need for constant manual updates. For example, a local legislative body publishes a legal document stipulating the rearrangement of school districts in a city. Once the legal note is publicly available and uploaded onto the blockchain, all homes registered in the relevant district will automatically and instantly reflect the new applicable school district, without the need (or opportunity) for homeowner corroboration.

Blockchain-based MLS may vastly improve both the home buying and home selling process, eliminating data redundancies and inaccuracies that would otherwise be disruptive. Buyers and sellers alike could access a comprehensive real estate database with the assurance that all readily available public information is included. The need to juggle listings on different sites could be eliminated, and search parameters can be tailored precisely to desired specifications. Additionally, the reliability the blockchain offers would drastically reduce the need for brokership, minimizing costs to both the buyer and seller and maximizing return on investment.

Streamlining the Due Diligence Process: Once a buyer decides on a prospective home, a lengthy and sometimes cumbersome due diligence process typically ensues. Public records of deeds, occupancy history, transactions, and renovation history are stored physically, making the records prone to errors and loss of information. This is particularly true in the single-family rental market, where both landlords and tenants may find difficulty in locating information that would expedite the decision-making process, such as historical rents and tenant/landlord history of misconduct. A blockchain-based solution to this problem would be the creation of digital identities for a property. Physical documents, once uploaded to the block, remain there permanently and unalterably. Documents including renovation history, rental occupancy and rates, and transaction prices create a digital footprint of a given home.

While many of these documents may not be publicly available currently, incentives exist for buyers, sellers, landlords, tenants, and real estate brokers to upload otherwise private information. For example, tenants may want to publish their monthly rent payments on the blockchain to compare rates against similar properties, or to store a record of their payments securely on the chain. In regards to home renovation, a homeowner may want to upload appraisal information onto the blockchain to compare rates against other homes that have undergone similar renovations. The renovator, in turn, has the opportunity to boost their reputation, a further incentive to upload renovation details onto the chain. This stream of data creates a comprehensive database, which homeowners may access to evaluate different rates, job types, and build quality of various home renovators.

Simplifying Mortgage Underwriting: Traditionally conducted using solely paper documentation, the mortgage underwriting process suffers from a host of inefficiencies that can potentially enable fraud. Blockchain technology could not only minimize the potential for fraudulent activity, but also simplify and streamline the process more broadly. Before the mortgage is originated, lenders would be able to access the blockchain for data on buyer credit history, rental/past mortgage transactions, and other data without the need for significant due diligence, saving time and reducing costs.

Once a mortgage is issued and uploaded to a blockchain, an unalterable record would exist, thus making the illegal double-pledging of assets nearly impossible. Monthly mortgage payments may be uploaded to the block in real time, providing a host of transparency benefits to both mortgage issuers and mortgage-backed security investors. Smart contracts and asset tokenization enable the seamless allocation of each mortgage payment to the respective beneficiary without the need for third-party verification. Relatedly, blockchain technology enables the real time reporting of accounting information. Financial statements would not need to be “prepared” as each transaction relevant to a firm would be already included in the block at the time of occurrence. In turn, investors will gain enhanced visibility into company operations, and regulators may conduct real time audits and investigations with ease.

Providing Superior Liquidity Through Tokenization of Real Estate Assets: Blockchain-based systems use non-fungible tokens (NFTs) to display ownership of an asset. They function similarly to the physical deed of a home, as they provide proof of ownership. NFTs are transferred automatically upon the sale of a home once the conditions of a smart contract are satisfied. Since the transaction is verified on a blockchain, it is immutable and its record is permanent. The buyer will retain possession of the NFT until they conduct a transaction like selling the home or passing it along in a will.

The benefits of tokenization of real estate assets are not limited to transaction visibility and security. Once the home is tokenized, its owner would freely be able to sell equity in their home without selling the home itself. This is best illustrated in the rental market; the owner of a rental unit may sell a portion of their tokens on the open market, and retain as many as they like. NFT technology allows for many investing parties to participate in such investments without any confusion surrounding the rent allocation process. Upon the tenant's completion of a rent or mortgage payment, the blockchain can automatically and immediately distribute each investor's portion of the payment without the need for a trusted intermediary. Tokenization of real estate assets would drastically increase liquidity through fractional ownership, near-instant transaction processing, and no need for intermediaries. It would further provide an opportunity for long-term homeowners to unlock value without having to sell the home and move.

For the first time in the U.S., buyers were able to test drive this new technology. A Tampa, Florida home hit the market at $650,000 on February 10, 2022, with the entire balance payable via Ethereum and the deed transferred as an NFT. Over 1,500 bidders registered to participate in an online auction, speaking to the magnitude of interest in this nascent technology. The winning bid was 210 ETH, or ~$653,000 at the time.

Pitfalls and Barriers to Adoption

Blockchain technology has the potential to increase real estate market liquidity, provide increased transparency and security, lower transaction costs, reduce fraud, and simplify the property search process through centralized data, among other benefits. Adoption, however, does not come without potential negatives.

Given the novelty of the technology, government bodies are not yet equipped to regulate or tax transactions on the blockchain. Lack of public understanding poses a major barrier to adoption; purchasing a home is often an individual's largest financial investment in life, and they are unlikely to adopt a new technology without first understanding it. Data privacy is another concern; once data is uploaded onto the blockchain, it remains there permanently. Along with the increased transparency, people with malicious intent may be able to access an individual's complete history of residence, house information, and rent payments, among other data. While numerous incentives exist to upload detailed data onto the blockchain, the blockchain is only as complete and effective as the data its users provide.

Impact on the Investing Community

Blockchain is already beginning to revolutionize the way investors view the real estate market. There are a number of blockchain-based real estate investment platforms advising clients on fractional real estate ownership through the use of NFTs. This emerging niche is gaining significant traction. Expensive real estate assets that would have been out of reach to investors are more affordable at lower sticker prices and provide far superior liquidity to traditional real estate investments.

Many firms operate on a blockchain network and offer transaction security services, using distributed ledger technology to mitigate wire fraud risk and hacker intervention. One platform helps landlords use blockchain technology to conduct thorough credit background checks on prospective tenants, as well as manage rent payments and maintenance tickets on the blockchain for increased transparency and security. Over 5,000 multi-family buildings in New York City alone use this platform to manage their residents.

Crypto in Mortgages

It is rare to find “new” types of mortgages in the post-crisis U.S. mortgage finance market, as the long tail of memory has understandably diminished the appetite for complexity amongst borrowers, lenders, regulators, and investors. It is a market ruled by incrementalism where processes — such as rolling out a method to estimate incomes from bank statement cash flows when a borrower has complicated tax returns — can take years. Recently, however, a new crypto-adjacent mortgage product has gained prominence with a straightforward motivation: allowing crypto investors to utilize their investment gains to secure a loan without incurring the tax event and loss of further upside if they were to liquidate said crypto currency into cash.

As an alternative, these new mortgage products allow potential homebuyers to post a portion of their total cryptocurrency holdings as collateral to secure the loan. One lender, for example, requires crypto deposits at least equal to the purchase price to be transferred into a custodial account. If the value of the cryptocurrency declines, the borrower may be subject to margin calls and ultimately the cryptocurrency may be liquidated if the collateral value falls below a certain threshold, such as 35% of the property value. In exchange, the borrower is eligible to receive financing for up to 100% of the purchase price, does not incur capital gains, and is able to remain exposed to any perceived investment potential in the crypto portfolio.

Similar products have been around for a long time. For example, many private wealth arms of banks may offer a similar type of mortgage loan to clients using more traditional investment assets. Nevertheless, there are some concerns related to long-term viability. Foremost is the fact that the down payment exists to serve as a dampener to the risk exposure of the loan, whereas introducing cryptocurrency exposure into the credit profile arguably increases the overall risk of the loan. We note the inclusion of margin calls and indications that a mortgage rate can be reset depending on the degree of collateralization, could be a regulatory hurdle in some jurisdictions. As a reaction to the housing crisis, the Dodd-Frank Act included robust provisions mandating an originator thoroughly assess a prospective borrower’s income, assets, and liabilities in a regimented manner to determine whether they have the ability to repay the loan. For variable payment products like an adjustable rate mortgage, this would include analysis such as determining the capacity to afford the payment at the interest rate ceiling. With this requirement and awareness of crypto’s high volatility in mind, it could be challenging to make a primary ability-to-repay determination over the life of the loan based off crypto reserves. This issue may be compounded if the payment rises in the event of a downturn in cryptocurrency prices. And these types of borrowers who rely on crypto as a source of income are generally locked out of conventional financing, as government-sponsored enterprises Fannie Mae and Freddie Mac generally do not consider cryptocurrency holdings for income and asset documentation.

With all that said, the core idea of protecting from capital gains tax and a more liquid reserve account for credit exposure can potentially be mutually beneficial to both originators and borrowers, if the financial assets in question were stable and liquid. In some cases, lenders will only allow more stable cryptocurrencies as collateral. While relatively new in the lending space with little volume of originations, innovations like this bear watching.

Digital Real Estate

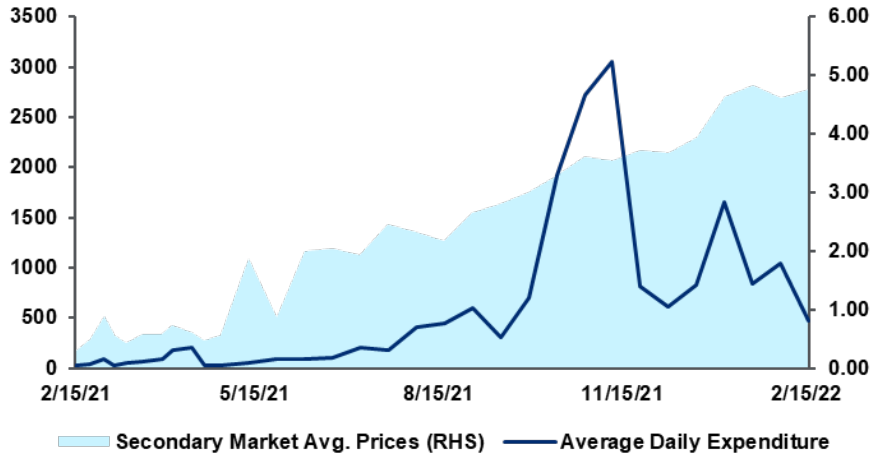
Digital real estate broadly includes any form of online property with the opportunity for ownership and monetization. Websites, smartphone apps, software, and most of the common web-based technologies we use fall under the definition. In light of recent advancements in Metaverse technology, "digital real estate" now also includes virtual land assets. Much like physical real estate, Metaverse participants can buy virtual parcels of land, develop them, rent them, and sell them. To better understand this new virtual real estate ecosystem, it is helpful to understand Metaverse dynamics and consider a specific Metaverse as a case study.

The Citi GPS report *Metaverse and Money: Decrypting the Future* noted the Metaverse may be the next iteration of the internet, or "Web3," utilizing decentralized, blockchain-based technology. Web1 includes static web pages only accessible via a computer at a static physical location. The advent of mobile phones brought about Web2, which includes mobile computing power, social media sites giving users a voice, and sites updated in real time. Web3, or the decentralized internet, marks a shift from the data consumption model seen in Web1 and Web2 to a data experience model. Tools such as virtual and augmented reality, virtual worlds, digital assets, and cryptocurrency allow Web3 participants to engage with and experience the internet similar to how they engage with and experience the physical world.

It is key to understand that as the Metaverse has only just begun to emerge, no true and comprehensive way to define it exists. Similar to the way the mobile internet (Web2) did not replace, but instead fundamentally changed, the way we understand and interact with the internet, Web3 is expected to do the same. Web2 changed when, why, and how we access the internet, but it also changed the things we buy, the way we spend our free time, our social culture, business models, and politics. It is not surprising, then, that despite the nascent state of Web3, massive changes to the way we understand digital real estate are already beginning to manifest.

Jamie Burke, a major venture capitalist in the Metaverse space, provides a helpful definition: "The Metaverse is effectively an interface layer made up of hardware and software that makes the physical and virtual worlds indistinguishable from one another." Everything in the Metaverse (e.g., avatars, land, digital assets) is held as a non-fungible token (NFT) on a blockchain which allows for unforgeable verification of ownership of the assets. There are two main types of Metaverse worlds: (1) a centralized world controlled entirely by its builder (usually a company); and (2) a decentralized world, such as *The Sandbox*, built on a decentralized blockchain and governed entirely by its users.

Figure 31. *The Sandbox* LAND Volume Peaked in November, With Prices Still Rising (Units in ETH)



Source: CFTE, OpenSea, Citi Research

The Sandbox is one of many decentralized, blockchain-based worlds featuring entirely user-developed digital goods and gaming experiences. *The Sandbox* is comprised of 166,464 parcels or "LANDs," each of which measures 96x96 meters. Much like the physical world, *The Sandbox's* environment abides by the laws of gravity and scarcity of land and assets. *The Sandbox's* LANDs can be purchased either from *The Sandbox* directly or more commonly on a secondary marketplace using cryptocurrency Ethereum. Once purchased, users have the freedom to develop (or rent out) these properties however they choose. Users may develop proprietary video games on their LAND and charge other users a fee to play. They can also set up a marketplace on their LAND to sell NFTs, a museum to display them, or erect billboards with the goal of generating ad revenue. Perhaps the most famous LAND development project across any virtual world thus far is rapper Snoop Dogg's "Snoopverse," an environment featuring concerts, virtual hangouts, and games allowing user participation.

The "Real" Estate Market: *The Sandbox* houses the largest real estate market of any virtual world — 65,000 LAND transactions took place in 2021 totaling ~$350 million. As the platform grew in popularity, average LAND prices exploded from ~$100/LAND in January 2021 to ~$15,000/LAND by December. From November 2021 to January 2022, an average of 8,000 LAND transactions occurred per month at ~$13,000/LAND, with individual LANDs trading as high as $200,000. Much akin to physical real estate, the value of LAND is heavily influenced by location, and supply and demand. A plot of LAND adjacent to the Snoopverse, for instance, sold for ~$450,000. LANDs in central locations generate increased virtual foot traffic, thus increasing demand particularly for developers with profit-driven incentives. *The Sandbox* even includes its own cryptocurrency, SAND, which is used in the world to transact LAND and NFTs and is considered a helpful tool to value the platform. SAND received peak valuation on November 25, 2021 with 1 SAND valued at ~$8.31, implying a ~$7.7 billion market cap. As of May 26, 2022, 1 SAND is valued at ~$1.33, implying a ~$1.2 billion market cap.

LAND Financing: Similar to mortgage financing in the real world, prospective LAND owners can receive loans from third parties to finance the purchase of LANDs. The LAND deed is held as collateral by the loan originator as an NFT, while the prospective LAND owner obtains full rights to occupy and develop the LAND as they choose. Upon full repayment of the loan, the deed, as an NFT, is transferred to the LAND owner providing proof of ownership. One of the first companies to offer virtual mortgages evaluates prospective buyers' plans to generate return on investment on the property before offering any capital. In addition to providing mortgage financing, this firm also engages in full-service real estate management, including construction/development of virtual properties, rent collection, and tenant representation.

Corporate Involvement: Given the nascent nature of the virtual real estate environment, many of the purchasers of LANDs lack concrete plans to cultivate the properties and are simply speculating on the platform's future growth and thus LAND price appreciation. On the other hand, several large corporate players bought into *The Sandbox* and the similar world *Decentraland* with the expectation of conducting legitimate business activities in the virtual environments going forward.

In December 2021, a global accounting and advisory firm invested ~$35,000 in a *Decentraland* property and developed a three-story virtual office building. The building includes a museum to display clients' NFT pieces, a rooftop for hosting events, and business offices. The firm plans to provide advisory and accounting services to an increasing number of clients wishing to conduct business in the Metaverse.

Another global advisory firm acquired virtual land in December 2021 to advise clients on the opportunities and challenges inherent to conducting business in the Metaverse. Such clients may include the likes of major footwear retailers, that have created virtual spaces to create a digital marketplace for their exclusive content, including proprietary NFTs. Separately, a Metaverse real estate development firm paid a record ~$4.3 million for LANDs to develop 100 "Fantasy Islands," each equipped with villas, boats, and jet skis. Ninety of the islands sold within 24 hours of listing at $15,000 per island and are fetching north of ~$100,000 in resale markets.

Institutional Single-Family Rentals

The single-family rental (SFR) industry is highly fragmented with the majority of homes owned and operated by “mom and pop” investors. According to company filings in the first quarter of 2022, those who own one to nine units hold ~80% of SFRs. Before the 2008 recession, the “mom and pops” owned an even larger share. When housing prices fell during the recession, large institutional investors saw an opportunity and began deploying capital to purchase single-family homes in bulk at well below replacement cost. Given some of the largest asset managers entered the space over this period, many considered this the “institutionalization” of the sector. Naturally, there are many polarizing environmental, social, and governance (ESG) concerns. Do “mega landlords” raise rents and evict at a faster pace? Are they crowding out the average homeowner? Or, do they provide safer, more efficient shelter with a better customer experience? We discuss some of these issues below.

After considerable public consolidation across the single-family rental sector over the past decade, there are now three remaining large “pure play” SFR companies in the real estate investment trust (REIT) space, in addition to private capital pouring into the sector. In aggregate, large institutional owners (those who operate 1,000 or more units) own ~480,000 homes in the U.S., or 3% of the total market of single-family rental homes according to company filings in the first quarter of 2022 and census data.

While single-family rental homes across the nation include markets and price points that REITs would likely not invest in, the point remains that the industry continues to be highly fragmented. In addition to institutional investors, the proliferation of omni-channel acquisition methods, particularly through the use of iBuyers, have injected further liquidity into the housing market. Capital continues to flow into the space, with ~$40 billion of announced SFR transactions since March 2020. In addition, the rise of build-for-rent housing has gained traction.

Institutional ownership of SFRs represents a financial innovation as it was not previously recognized as a viable asset class, and in turn, SFR operators are in a position to drive technological innovation. Compared to other sectors of the economy, participants in the housing market (e.g., REITs, homebuilders, brokers) historically have spent little to nothing on technology R&D. Housing markets are generally viewed as hyperlocal, being made up of players too small to drive major innovations or benefit from those innovations at scale. Institutional SFR ownership is changing that calculus: large SFR operators are investing in technology to drive margin expansion. One major SFR operator expects to drive ~10% of revenue from ancillary services, including “permission to enter” technologies that streamline maintenance work, landscaping, pest control, and other revenue generating opportunities. In addition, technology has helped on the expense side by allowing operators to have proportionally fewer people in the field and be more efficient with service.

ESG Perspectives: Weighing the Pros and Cons

Despite the compelling benefits and attractive economics of SFR and build-for-rent from an investment perspective, we are cognizant of ESG risks. For decades, homeownership has been the most effective, reliable, and common way for Americans to build wealth. As declining homeownership rates largely drive rental demand, “build-for-rent” investors directly benefit from a shift away from homeownership. The rise of SFRs raise concerns that long-term renters may be outbid in the housing market, denying individuals opportunities for wealth creation.

Institutional SFR investors typically take a methodical, disciplined approach to property selection. Acquisitions are concentrated on clusters of properties in neighborhoods with favorable household formation trends, wage growth, and school districts. Once a desirable area is identified, institutional buyers can move quickly into the market; in many instances, their scale allows them to outbid private homebuyers with all cash, no contingency offers. Would-be homebuyers, outbid by their larger competitors, subsequently turn to rental markets, further fueling demand and higher rental rates in the area. By creating a tightly controlled ecosystem of rental units in desirable neighborhoods, institutional owners could dominate local markets, artificially buoying home prices and rents.

Other ESG concerns have come to the forefront regarding tax policy and tenant protection. How aggressively should a landlord pursue property tax reductions, potentially maximizing profits at the expense of community reinvestment? With sharp increases in home and property values comes higher property tax costs for SFR operators. In the pursuit of maximizing shareholder value, SFR operators have recruited third-party lobbyists to petition local authorities for property valuation reductions. These property markdowns result in lower state and local tax costs for SFR companies, driving higher margins. On the one hand, the SFR operator has a fiduciary responsibility to maximize shareholder return; on the other hand, by paying lower taxes, an institutional landlords' reinvestment into the surrounding community may be diminished.

Tenant protection legislation can conflict with SFR investor interests. Rent stabilization and rent control measures in various municipalities can prevent SFR investors from unlocking the full value of their investment, particularly in the short term. In 2018, a private equity-backed SFR operator contributed ~$7 million to oppose a campaign that would have extended rent control to single-family homes in California. Though unsuccessful, the attempt speaks to the potential tensions between tenant interests and SFR profits. While the tensions between landlords and tenants are of course nothing new, the institutionalization of SFR and emergence of well-capitalized, publically-traded "mega landlords" may create greater alarm among renters (and voters), compared to smaller local landlords, who often purposefully keep a lower public profile.

Traditionally, "mom-and-pop" and other corporate investors in rental properties sought long-term returns through appreciating home and land values. Rent payments provided a steady stream of income in the interim; thus, rent increases were introduced gradually, as landlords did not want to risk losing tenants by raising rents too rapidly. Institutional SFR investors, on the other hand, could have a shorter-term investment horizon in some cases. A shorter-term approach could result in more aggressive rent increases, coupled with cuts in operational costs. In 2021, a U.S. Senate hearing was held entitled "How Private Equity Landlords are Changing the Housing Market." At the hearing, current residents of SFR communities owned by private equity (PE) firms testified about sudden unnecessary fines and service fees, excessive rent raises, and poor maintenance standards. Testimonies from renters in Nevada, Arizona, and Texas complained of regular flooding, rodent infestations, and lack of hot water. Some residents testified the rent increases and worsened quality-of-living began shortly after the new PE landlords purchased the properties. Additionally, a study performed in Atlanta, one of the nation's most active SFR markets, found that institutional landlords are more likely to pursue evictions than smaller landlords.

Demand Drivers

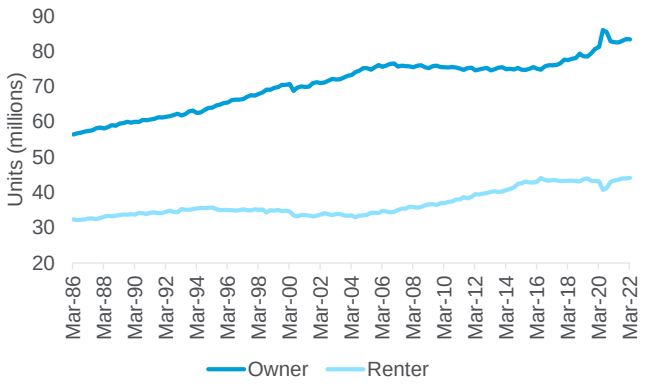
The key demand drivers for the single-family rental industry are similar to that of the multifamily industry: demographic trends, delaying of life events, household formation, home ownership rates, job and income growth, and the cost of purchasing and financing a home.

Renter-occupied housing units account for ~35% of total housing units in the U.S, higher than levels prior to the Great Financial Crisis (GFC). Current trends include a higher propensity to rent versus own among the growing Millennial demographic, delaying of life events (marriage, children, and home buying) by the Millennial generation, and higher student debt levels among Millennials and the resulting difficulty in affording a down payment on a home. There was an increase in owner-occupied units in early 2020, which we attribute to people vacating rental housing at the onset of the pandemic (i.e., moving back home with family).

Historically, home ownership rates have averaged 66.5%. Ownership rates peaked in late 2004 at 69.2% and then steadily declined until bottoming in mid-2016 at 62.9%, before rising again to 65.4% by the second quarter of 2021. The younger cohorts (i.e., those under the age of 35), which are prime candidates for single-family rentals, have a home ownership rate of ~38%.

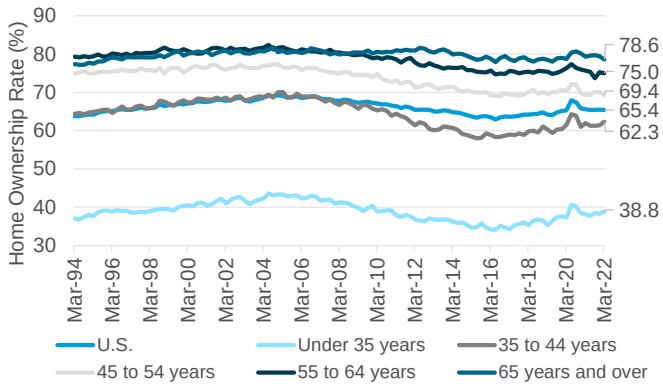
In general, lower home ownership rates are a boon for single-family rentals — and all rentals for that matter — as the potential tenant base is growing. Broadly speaking, any factor that would reverse that trend (e.g., looser mortgage financing, lower home prices) would be seen as a headwind for the single-family rental sector.

Figure 32. Renter- vs. Owner-Occupied Housing Units for the U.S.



Source: U.S. Census Bureau, Citi Research

Figure 33. Home Ownership Rates by Age



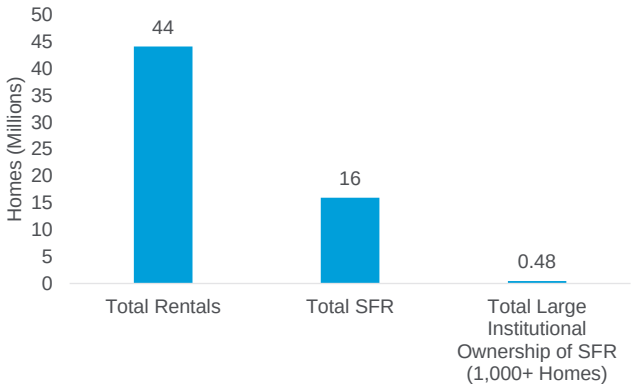
Source: Current Population Survey/Housing Vacancy Survey, U.S. Census Bureau, Citi Research,

A New, Rapidly Growing Model

The largest SFR companies have a combined portfolio of ~480,000 homes out of a total 16 million SFRs, or a 3% share of the industry. Given that ~97% of single-family rentals are owned by traditional "Mom and Pop" investors, the industry remains poised to see a continued inflow of capital for both acquisitions and development.

But while large "mega landlords" represent a small share of homes owned, overall investor excitement in housing runs the risk of crowding out the average homeowner. In a February 2022 study from Redfin, the real estate firm noted that nearly one-third of homes sold in places like Atlanta and Charlotte went to investors of some kind.[3] They also noted that the majority of investment (~75%) was in the purchase of single-family homes, and there was a shift away from low-priced homes to mid-priced ones.

Figure 34. Totals for the U.S. Rental Housing Market



Source: U.S. Census Bureau, Company Filings, Citi Research

Figure 35. Share of Home Sales to Investors in 4Q 2021

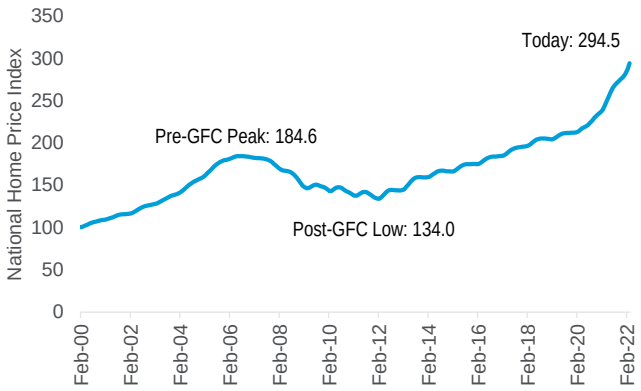
Source: Redfin, Citi Research

Housing Price Affordability Is a Factor in the SFR Industry

Housing affordability is a major factor for the industry since purchasing a home would be the primary alternative to renting a single-family home. One of the primary reasons cited by tenants for moving out of a single-family rental is to purchase a home. However, as home price appreciation (HPA) continues to rise, many first time homeowners are priced out of the market. As highlighted below, data from CoreLogic shows the average single-family home price more than doubled from the post-GFC low and has increased ~34% since the onset of the COVID-19 pandemic in February 2020. In addition, the absolute median home price has increased to ~$407,000, up from a post-GFC low of $155,000 and a pre-GFC high of $231,000.

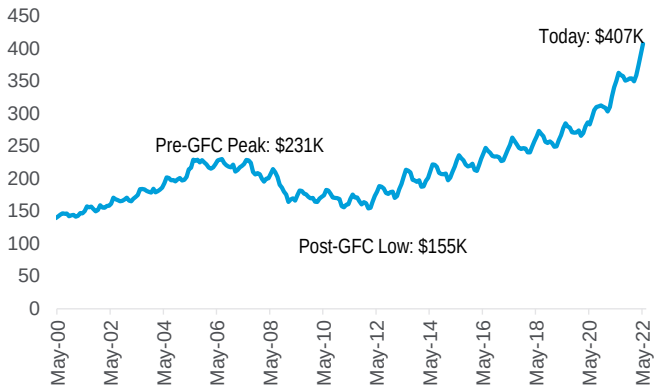
[3] Dana Anderson and Sheharyar Bokhari, "Real Estate Investors Are Buying a Record Share of U.S. Homes," Redfin, April 16, 2022.

Figure 36. U.S. National Home Price Index (Seasonally Adjusted)



Source: Haver Analytics, CoreLogic, Citi Research

Figure 37. U.S. Median Existing Home Sale Price ($'000s)



Source: Haver Analytics, National Association of Realtors, Citi Research

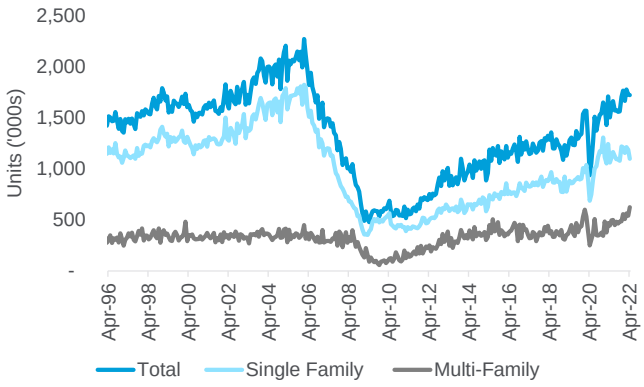
Supply Remains Low

Single-family (1-unit) construction has historically made up the majority of residential construction across the U.S. However, supply continues to lag demand, as the U.S. is undersupplied by an estimated 5 million housing units. Multifamily construction has become a greater proportion of the total residential construction as home ownership rates have declined.

Recently, total residential construction has approached the long-term household formation rate. Multifamily construction continues to represent a larger proportion of total residential construction relative to historical levels, but single-family construction is recovering. Risks to supply chains, increasing costs, and additional concerns related to the pandemic could exacerbate the housing shortage.

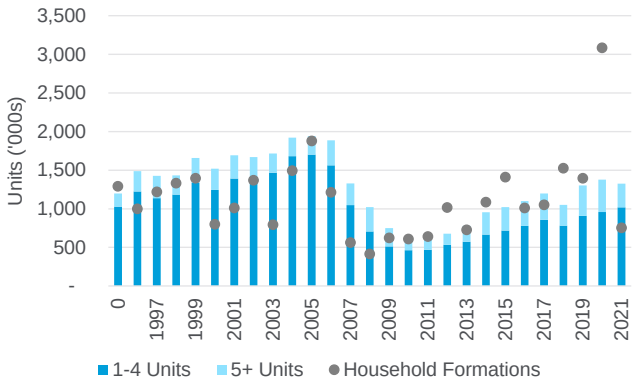
While the single-family construction data shown below does not delineate between for-sale versus for-rent homes, most construction is for-sale housing, though a growing percentage is specifically build-for-rent product. Ultimately, an increase in construction of for-sale single-family homes could impact the rental market if it corresponds with an increase in the homeownership rate.

Figure 38. U.S. Housing Starts — Single and Multi-Family



Source: U.S. Census Bureau, Citi Research

Figure 39. U.S. Housing Completions and Household Formations



Source: U.S. Census Bureau, Citi Research

Build-for-Rent: Homebuilders Jumping Into SFRs

A number of large production homebuilders are directly pursuing build-for-rent opportunities. Build-for-rent (BFR) homes are fully designed, constructed, and marketed as rental units. BFR is the fastest growing sector of the American housing market; BFR construction jumped 30% year-over-year in 2020 and in 2021 BFR homes comprised ~6% of total U.S. housing starts. The space is rapidly evolving to include master-planned BFR communities. For builders, the construction process of a BFR home (or community) is not materially different from build-for-sale home construction; if anything, customization needs in BFR homes tend to be minimal since the homes are not owner-occupied, helping to reduce development costs. For investors and landlords, the BFR model helps lower maintenance costs compared to traditional rental units, driving returns.

Many institutional investors have begun to take a “ground-up” approach utilizing the BFR model, where entire communities of homes are constructed with the intent to rent them. Build-for-rent offers attractive economics; rental rates in a given community typically rise at faster rates than the surrounding area, and operational efficiencies during construction of large scale communities drive down developer/builder costs. The result has been a rush to obtain land suitable for developing rental communities, and notably, accelerating rental yields in certain markets have allowed build-for-rent investors to outbid homebuilders for plots of land. The result is booming BFR construction, particularly single-family homes. In 2021, SFR starts of ~51,000 rose 16% year-over-year from 2020 and gained momentum as the year progressed (~15,000 or ~30% of starts in the fourth quarter of 2021). Builders are increasingly taking part in the growth of the sector, though historically have not been as active in the build-for-rent space. One major U.S. builder has contracted with an SFR landlord to deliver ~7,500 homes over the next four to five years, with another setting aside ~2% of controlled lots exclusively for SFR construction.

A single-family build-to-rent community of standardized “smart homes” has the potential to raise through-cycle returns for builders and landlords and improve tenant quality of life. During the construction phase of an SFR community, builders may choose to standardize as much of the homebuilding process as possible; customization options on build-for-rent homes tend to be minimal.

In our view, build-for-rent communities could act as a vehicle to accelerate homebuilder adoption of next generation technologies such as 3D printing, offsite manufacturing, and technology-enabled modular construction. As we detailed in our first Citi GPS report *Home of the Future: Building for Net Zero*, these technologies have the long-term potential to shorten the construction process, reduce labor needs and costs, and allow for better planning to procure materials and labor, driving builder returns. Smart home technology would give each home in the community a digital footprint, with the entire SFR community digitally accessible. Community digitization could bring opportunities to enhance landlord returns and improve renter quality of life.

For instance, a landlord could choose to contract various repair/maintenance services to serve the entire community at a lower rate. This could create an ecosystem of consistently available repair services for residents. Using smart home technology, residents using an app could select a job type (electrical work, for instance) and time that they will be away from home; the community's electrician would be granted access into the home using smart locks, and the resident would receive notifications upon entry, successful completion of the job, and exit. Through this arrangement and others similar in nature, landlords could provide repair, maintenance, gardening, and even recreational services to residents at a lower cost. Newly constructed BFR smart homes could be prime candidates for iBuyer transactions, facilitating vastly improved liquidity in the residential real estate market.

A Potential Model for Success in Innovation

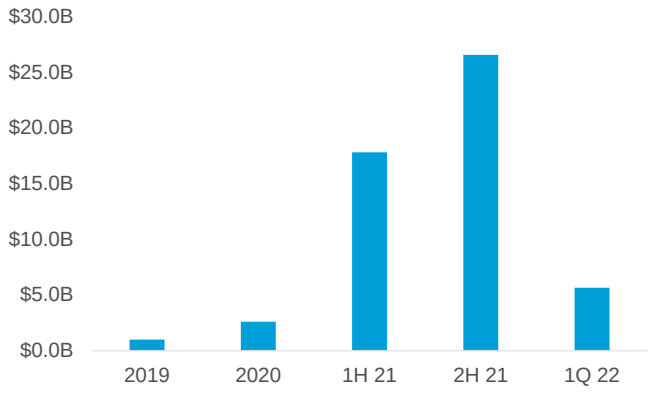
One common theme throughout the maturation cycle of these residential strategies is that technological innovation — viable and impactful as it frequently can be — is useless without efficient boots-on-the-ground operations. Nowhere is this more evident than through observations amongst the single-family rental operators over the past several years.

Initially borne out of the glut of foreclosure inventory in 2012, the emergent business strategy of institutional investors faced much early skepticism. Many of the current generation of residential innovators face similar questions. Can sufficient scale be achieved? Will that scale truly yield the necessary operational efficiencies? And can the operations withstand volatility in the housing market? The debate at the time was on whether the purchasing of homes was a trade or a business. Given the rapid growth in the sector we now know it is a business. And as we think forward to the Home of the Future, will many of us remain as renters rather than buy?

In the intervening decade since the GFC, large institutional buyers have scaled their investment from zero to over 480,000 homes and — despite issues with supply chain/labor and increased tax/homeowner association/insurance costs — managed to add roughly 500 basis points of gross margin through efficiency gains on a relatively consistent upward trend across the board from 2018 through 2021. Additionally, the business appears now to be growing at a faster rate than we have seen at any prior time. Total equity capital raised for SFR acquisitions was recorded at $44.4 billion in 2021. By comparison, the total amount of equity capital raised in 2019 and 2020 for SFR acquisitions combined was $3.6 billion.

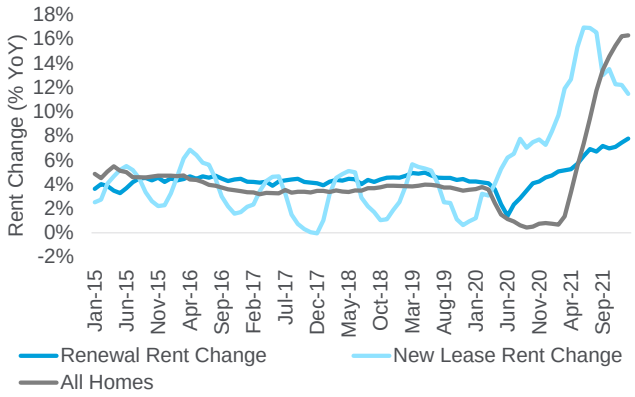
Ultimately, the industry will need to balance out profit growth, customer experience, affordability, and political pressures to thrive. And it seems some of this is playing out; for the five years leading up to the pandemic, renters renewing leases with SFR companies saw rents rise 0.4% higher than national estimates of all housing but now those same renters are renewing leases at rents around half the current national run rate. Perhaps these companies now appear more focused on occupancy. While polarizing in many respects, the asset class has grown materially and merits focus.

Figure 40. Equity Capital Raised Blossomed in 2021



Source: Company filings, John Burns and Company Reports, Citi Research

Figure 41. Rent Raises for Large SFR Companies Tended to Outpace the National Average Slightly, But Now Is Slower



Source: DBRS/Morningstar, Zillow, Citi Research

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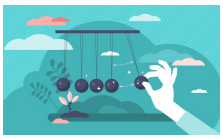

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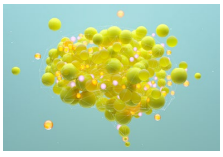

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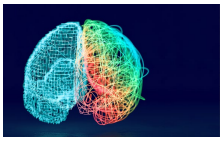

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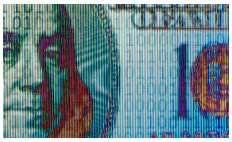

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Volume 2
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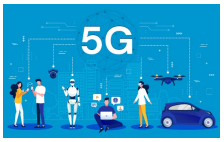

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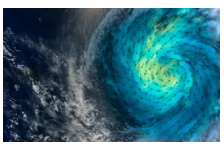

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Key Insights regarding the future of a Frictionless Housing Market

INNOVATION

Tight supply and robust demand, growth of institutional investment, and technological advancement in housing finance operations are driving innovation in the U.S. housing sector. / Tech startups are innovating new ways of interacting with the housing ecosystem and driving efficiency across the transaction process.

SHIFTING WEALTH

Demographic trends among millennials, including low homeownership and high student debt levels, are a key demand driver of single-family rentals (SFRs). / Only 2% of SFRs are institutionally owned but environmental, social, and governance (ESG) concerns over institutional landlords will need to be addressed.

TECHNOLOGY

Mortgage underwriting, title insurance, and other processes are ripe for innovation. Combining escrow and closing services on a tech platform, for example, could speed up closing times by 15%-25%. / Blockchain technologies may open further opportunities. These include reducing transaction costs through smart contracts and improving liquidity through tokenization of real estate assets.