The Economic Implications of Housing Supply

By

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I. Introduction

Housing is both an investment and consumption good. Its production is almost prosaic in its use of simple resources like lumber, yet its financing involves trillions of dollars in mortgages that were central to the recent global financial crisis. As different as a two-by-four may be from a complex collateralized mortgage-back security, the simple fundamentals of housing supply are central to understanding housing markets, the securities that are tied to them, and America's economic geography.

The financial aspects of housing were the focus of attention during the last cycle and housing investors in Las Vegas during the boom mistakenly concentrated on low interest rates rather than the ease of building in that metropolitan area. Ten years after the housing boom peaked and four years after the bust cratered,[1] policy advocates now worry more about the amount of affordable housing in high demand areas than the exposure of investors to housing-related risk. Interest has also grown in the role that high home prices play in the distribution of wealth (Rognlie, 2015; La Cava, 2016) and even aggregate output (Hsieh and Moretti, 2015). Housing supply helps determine affordability, wealth inequality and the relatively modest employment growth in productive places like Silicon Valley.

In this essay, we review the basic economics of housing supply and the functioning of U.S. housing markets to better understand the impacts on home prices, household wealth and the spatial distribution of people across markets. Section II documents the state of housing affordability in the U.S., and begins with three core facts about housing supply. First, when building is unrestricted by regulation or geography, housing supply curves seem relatively flat, meaning that we can approximate reality by referring to a single production cost. Second, both geography and regulation severely restrict the ease of building in some parts of the country. These constraints raise building costs both directly, by increasing time delays and reducing the amount of available land, and indirectly, by ensuring the homes are produced more on a one-by-one basis rather than in bulk. Third, the supply of housing is kinked and vertical downwards because housing is durable (Glaeser and Gyourko, 2005).

In some parts of America, there has been a revolution in the regulation of home building over the past 50 years (Glaeser, Gyourko and Saks, 2005). For most of U.S. history, local economic booms were met with local building booms, so labor could follow shocks to local productivity. However, between the 1960s and the 1990s, it became far more difficult to build in the nation's most desirable locations, especially those along the coasts. Higher economic productivity in San Francisco now leads to higher prices, not more homes and more workers (Ganong and Shoag, 2013). This change has both led to a transfer of wealth to a few lucky homeowners and to a distorted labor market where people move to regions such as the Sunbelt that make it particularly easy to build (Glaeser and Tobio, 2008).

While affordability analysts typically compare housing prices or rents with incomes, we compare prices with the all-in cost of delivering housing units to the market. This supply cost is the

[1] The Case-Shiller 20 City Repeat Sales Index peaked in June 2006 and then hit its nominally lowest value in the past decade in March 2012.

natural minimum price that can be expected in a free market. We argue that housing markets are functioning well if they deliver homes at close to what we term minimum profitable production costs (MPPC). Even if housing is delivered at MPPC, poverty can still make housing costs a huge burden, but this burden reflects the distribution of income, not a failure in the housing market. When housing costs far more than MPPC, different housing policies such as less constraining building regulations can conceivably make housing affordable for more people. When housing costs no more than construction costs, then only cash or in-kind redistribution such as vouchers can make housing more affordable to the poor.

U.S. housing markets are classified into three different groups: those with market prices well below MPPC; those with prices near MPPC; and those with prices well above MPPC. The first group contains cities such as Detroit that were built during more successful times and now have an abundance of durable housing that is cheap because demand has fallen (Glaeser and Gyourko, 2005). These areas are almost all losing population, so builders have little incentive to provide new housing at current prices.

In contrast, housing supply is constrained by limited land availability and land use regulations in America's pricier metropolitan areas, which make up the third set of markets. In these places, it is the political economy of land use controls that accounts for the (positive) divergence between market prices and fundamental production costs. In the rest of the country, housing markets are best characterized by the classic textbook example of demand intersecting a highly elastic supply curve, so that prices are pinned down by minimum profitable production costs.

A conservative estimate is that more than three-quarters of home owners across a wide range of 98 metropolitan areas we analyze presently live in homes that are valued around or below minimum profitable production costs. The remainder are priced well above MPPC and are concentrated in a relatively small number of metropolitan areas situated on the east and west coasts of the country. Land is very expensive in these coastal markets, but across the bulk of the country, land is abundant and cheap.

The development of inelastic supply in some of our most successful metropolitan areas is a relatively recent phenomenon. As late as the 1960s, building was lightly regulated almost everywhere. Much housing was built in all high demand areas, including coastal California and New York City.[2] However, there has been a great transformation since the 1970s, in which property rights have essentially been reassigned from existing land owners to wider communities, which have chosen to substantially reduce the amount of new building. This change reflected the growing power of anti-growth political movements and environmentalism more generally. These groups include historic preservationists in New York City, conservationists in California, and a myriad of local and state actors concerned about the costs of new development.

The fundamental nature of building is that it creates significant concentrated benefits for the land owner who is developing and widespread small harm to almost everyone else from the

[2]For example, Glaeser, Gyourko and Saks (2005) document there were 13,000 new units permitted in Manhattan in 1960 alone, which is nearly two-thirds of the 21,000 new units permitted throughout the decade of the 1990s.

inconvenience of construction and downward pressure on housing values from increased supply. In a system where democracy is limited by lobbying and corruption, the interests of developers can dominate. Conversely, if decisions are made by majority vote, development projects face a considerable disadvantage, especially since many of the potential beneficiaries of a new project may not live in the jurisdiction when the project is debated. If this view is correct, then the great transformation is unlikely to be reversed unless there are means for compensating existing residents for the downsides of development.

Binding supply side restrictions also have the capacity to shape the personal portfolios of millions of Americans. Macroeconomists have argued that much of the rise in the capital share of income in the U.S. documented by Piketty (2014) can be attributed to rising rents on housing (Rognlie, 2015). Moreover, La Cava (2016) argues that much of this impact is concentrated in the major coastal markets that have high prices relative to minimum production costs. At a more micro level, we estimate that a typical homeowner fortunate to have bought into the San Francisco market in the mid-1980s experienced nearly a tripling in the real value of her land over the next three decades.[3]

We use the *Survey of Consumer Finances* to track changes in home equity between 1983 and 2013, and find that younger Americans typically have less housing wealth than their counterparts did thirty years ago. Most people live in areas that have not experienced high price growth and the younger households who own homes in pricy areas have large mortgages. The wealth gains appear only among the richest members of the oldest cohorts, so only a small sliver of America is sitting on a large amount of housing wealth.

The changes in housing wealth reflect redistribution from buyers to a select group of sellers, but restricted supply is also a distortion that limits the movement of workers in high cost areas. Hsieh and Moretti (2015) have estimated that real GDP could be over 13 percent higher if there were plentiful new construction in high productivity markets so that people could move to equalize wages. We show that there can be a fairly wide range of outcomes depending upon model and parameter assumptions. However, our analysis indicates a cost of at least 2 percent of national output per year, so we agree that this change towards more restrictive residential land use costs has been very expensive for the nation.

The concluding section turns to the policy implications of housing supply. The available evidence suggests, but does not definitively prove, that the implicit tax on development created by housing regulations is higher in many areas than any reasonable negative externalities associated with new construction. Consequently, there would appear to be welfare gains from reducing some of these restrictions. Yet given the current local control over development, it seems unlikely the restrictive policies will be reversed any time soon, absent a new set of policies that would at least partially compensate the current winners from supply restrictions.

[3] This translates into over a one quarter million dollar real increase in value for small lot with a home of only 1,300 square feet of living area. See Section II for more details on this unit and calculation.

II. How Affordable is America?

Three central facts about housing supply in the United States are particularly relevant to our analysis. First, when supply is relatively lightly regulated, as it is throughout much of the American Sunbelt and the interior of the country, construction seems to be close to a constant returns to scale technology. This implies that we can talk sensibly about a single production cost. Gyourko and Saiz (2006) examine the heterogeneity of construction costs and find that the variance of costs is much smaller than the heterogeneity of prices. Moreover, many of the higher cost areas are places where construction is restricted, so it seems likely that regulations are also helping precipitate construction costs to rise. The weak relationship between costs and the amount of supply in America's elastic markets reflects the relative abundance of building materials such as wood, and less skilled construction workers.[4]

Second, some of America's local governments have made it extremely difficult to mass produce housing while others make it quite easy to build. The Wharton Residential Land Use Regulation Index (WRLURI) is based on surveys of land real estate professionals, and it documents remarkable differences in the difficulty of obtaining building permits across metropolitan areas (Gyourko, Saiz and Summers, 2008). Glaeser and Ward (2009) show that even within greater Boston, there are extraordinary differences in minimum lot sizes, which can vary from under one-eighth of an acre to over two acres, as well as myriad other restrictions including wetlands protections and limits on multi-unit development. Saiz (2011) documents how both regulations and geography limit building and increase prices across space. We discuss the impact of these regulations at greater length later in the section.

Third, housing supply is kinked so that it is downwards vertical at the existing stock. This implies that a reduction in demand does not immediately lead to a decrease in the overall housing stock (Glaeser and Gyourko, 2005). Housing is durable, so that the negative shocks experienced by many Rustbelt have only slowly eroded the housing stock. Durability implies an asymmetry between positive and negative shocks to housing demand, especially in places that are lightly regulated. In such areas, an increase in housing demand will act mainly to increase the stock of housing, but a decrease in demand will act mainly to lower prices.

An Economic Perspective on Affordability and the Supply Side of Housing Markets

Policy makers typically define housing affordability in terms of the share of household income one has to spend on a housing unit. A standard rule of thumb is that housing is deemed inappropriately expensive or unaffordable if the monetary costs of occupying your home exceed 30 percent of one's (gross) income.[5] Consider a worker with a spouse and two children earning

[4] Taller buildings also display their own constant returns to scale, because the per square foot cost of building to seven stories is quite close to the per square foot cost of building fifty stories (R.S. Means, 2015). That said, the cost of building up is much higher than the cost of building low rise dwellings.

[5] Various U.S. Department of Housing and Urban Development (HUD) programs use the 30 percent threshold. For example, developers of Low Income Housing Tax Credit (LIHTC) units may not charge rents in excess of 30 percent of tenant income. This also is the maximum that voucher recipients can be expected to pay towards their units.

the current federal minimum wage of $7.25 per hour. That translates into an annual income of $14,500 presuming 2000 hours of work (40 hours per week for 50 weeks). This household is going to struggle to meet basic needs if it is spending half its income on housing ($7,250 per year or $604.17 per month).

Whatever the social merits of this cutoff, it is defective from an economic perspective because it conflates poverty and income inequality issues with a malfunctioning of the supply of housing units. The housing market may be efficiently delivering units at no more than their true social costs of production, but poorer households still might not be able to afford such expensive durable goods without spending high shares of their (low) incomes on them. This situation reflects an income deficit not a failure in the housing market *per se*.

The 30 percent rule also is at odds with the implications of the standard spatial equilibrium model used in urban economics (Rosen, 1979; Roback, 1982). To see this, consider two areas of differing productivity, both of which otherwise offer identical amenities and housing units. In one area, incomes are $50,000 and housing costs $10,000. In the second area, incomes are $80,000 and housing costs are $40,000. Disposable after-housing cost income is identical in the two areas, which is a requirement of the spatial equilibrium. Yet, the first area is deemed 'affordable', while the second area is not. Equalizing utility levels across space implies that housing costs a higher share of earnings in higher wage locations. However, in no meaningful economic way is a household worse off in the high housing cost (but more productive) metropolitan area.

Throughout the remainder of this paper, we employ a more traditional economic approach to gauge whether a housing market is delivering appropriately priced units. Specifically, we investigate whether market prices equal the full social costs of producing the housing unit. If so, the market is well functioning in the sense that it efficiently delivers units at their minimum feasible production cost.[6] If prices are above this cost, then the market is not well functioning and is too expensive--for all households in the market, not just for poorer ones. Prices also can fall well below production costs, but as mentioned above, that reflects an unexpected drop in the economic fortunes of an area, and is not the consequence of a failure in the housing market.

There are three components to the cost of delivering a unit of housing to the market. One is the cost of the land (L) on which the housing unit sits. A second is represented by construction costs (CC) associated with putting up the physical improvements (i.e., the structure itself). The third is the entrepreneurial profit (EP) needed to compensate the home builder for taking on development risk. Using these three terms, we define the Minimum Profitable Production Cost (MPPC) of a unit of housing as follows:

(1) $MPPC = (L + CC)*EP.$

The Millennial Housing Commission (2002) report on American housing markets used the same metric in its analysis of owner-occupied housing affordability.

[6] Of course, poorer households still may have very high housing cost burdens that society may wish to address via transfers.

Vacant land sales are rarely observed in the United States[7], so we use an industry rule of thumb that suggests land values are no more than 20 percent of the sum of physical construction costs plus land in a relatively free market with few restrictions on building.[8] Physical construction costs are more readily observable, with estimates provided by a number of consultants and data providers to the home building industry. We use construction cost figures reported by the R.S. Means Company that are discussed below. The final term, EP, in equation (1) captures the gross profit margin on the builder's land and construction costs. This likely varies substantially across the housing cycle (as well as by builder to a more limited extent), so we use a stabilized value that is determined as follows. Longer run net returns on a portfolio of homebuilders range from 9%-11% per annum across the cycle. This implies gross margins of about 17% given the roughly 35%-40% cost of operations for such companies. Hence, EP=1.17 in our calculations below.

If housing prices (HP) equal minimum profitable production costs, then HP/MPPC=1 and housing cannot be produced more cheaply absent subsidies. Expensive markets are those in which HP/MPPC>1. Cheap markets are those in which HP/MPPC<1.

Variation Across Markets in the Cost of Supplying a Home: Conceptual Underpinnings

There is no reason to expect that minimum profitable production costs should be the same across markets. Geography is perhaps the most obvious reason why housing is more expensive to build in some places than others. Water limits land supply and makes building difficult. Bedrock makes it easier to build up (Rosenthal and Strange, 2007). Steep ground makes it much more challenging to build (Saiz, 2011).

The flat cities of the American Midwest are close to being the perfect building environment, as is much of the Sunbelt region. Conversely, America's coastal cities are considerably more difficult geographical environments for builders. California cities often have significant changes in elevation within a single metropolitan area. Both east coast and west coast cities are limited in that they can expand in only one direction – inland. All of America's oldest cities were built on major waterways because of the advantages of access to water-borne transportation. Consequently, the central business districts of markets such as Boston, New York, San Francisco and even Chicago are close to the waterfront. Developers in those places only have a semi-circle of land to develop at best. The island of Manhattan poses particularly unique challenges.

Local land use regulation, ranging from building code requirements to strict limits on the number of units delivered, also differs across markets and can affect construction costs associated with

[7] See Haughwout, Orr and Bedoll (2008) for data on the land parcels in the New York City metropolitan area. More recently, Turner, Haughwout and van der Klaauw (2014) address how local land use regulation affects welfare.
[8] We used this metric in earlier research (Glaeser and Gyourko, 2008) based on an *ad hoc* survey of home builders. It continues to be relevant and is consistent with the data analysis discussed below.

putting up the structure, as well as the underlying price of land.[9] Modern land use regulation in the United States dates back at least to the 1910s, when the initial zoning laws were enacted to physically separate different types of users, so as to limit negative externalities from spillovers. Over time, the types of regulation have expanded dramatically to include urban growth boundaries, minimum lot sizes, and planning and approval delays, among others.

The literature on this topic is now voluminous and has recently been reviewed, so we refer the interested reader to that work (Gyourko and Molloy, 2015). There is no doubt that binding density restrictions affect supply. For example, the median Boston suburb has a minimum lot size over one acre. This rule is not cheap talk, as it typically does mean that it is impossible to deliver more than one unit per acre. In some towns, minimum lot sizes can be as large as two, four or even sixty acres. One does not need a regression to figure out that a sixty acre minimum lot size will restrict new housing supply, but minimum lot size is strongly negatively correlated with new building across communities in greater Boston (Glaeser and Ward, 2007).

The presence of a plethora of restrictions makes it difficult to measure the overall strictness of the broader regulatory environment, but it is possible to describe the characteristics of the typical community. Gyourko, Saiz and Summers (2008) report that the typical regulatory environment in their sample of 2,611 communities across 293 metropolitan areas can be described as follows: (a) two entities are required to approve any project requiring a zoning change, so there are multiple opportunities for rejection; (b) minimum lot size restrictions are omnipresent, although most communities do not impose the one acre+ restrictions that Glaeser and Ward (2007) and Glaeser, Schutz and Ward (2006) identify in Boston; (c) development exaction fee programs also are now omnipresent; (d) the typical community imposes about a 6-month lag between submission of a permit request for a standard project and its approval

The most highly regulated communities (defined as the one-third most highly regulated places in the Gyourko, Saiz and Summers (2008) sample) also share the following traits. Local and state pressure groups are much more likely to be involved in the regulatory process in these communities than in the typical or most lightly regulated towns. More than half the highly regulated places have at least one neighborhood with a one acre (or more) minimum lot size rule.[10] Open space requirements, not just development exactions, are now common in highly regulated places. Finally, the most highly regulated places have project approval lags that average ten months in lengths, or two-thirds higher than the average community (and three times longer than in the least regulated, one-third of communities).

While there are not consistent time series measures of the local residential land use regulatory environment, there is widespread agreement among researchers that such regulation has proliferated across markets and become onerous in some places. This is consistent with an

[9] The United States is relatively unique in that land use is under local control, which accounts for the wide variation in regulation across communities. This is not the case in many other countries, including the United Kingdom and France, which have national planning agencies and guidelines set by their central governments.

[10] In contrast, only 5% of the one-third most lightly regulated communities had any neighborhood with a one acre minimum rule.

argument dating back to Frieden (1979), who first proposed that NIMBYism ('not in my back yard') is one of the foundations of rules to alter, delay or stop residential development. There is less agreement on how and what started that particular movement and those related to it.[11]

With respect to the implications of binding regulatory restrictions on prices and quantities in the housing market, the general conclusion of existing research is that local land use regulation should function to reduce the elasticity of housing supply, and that this should result in a smaller stock of housing, higher house prices, greater volatility of house prices and less volatility of new construction. Most results are consistent with these implications and we report additional evidence below. However, data limitations mean that this work mostly is cross sectional in nature, and thus subject to standard potential biases associated with omitted variables and reverse causality.[12]

What Does It Actually Cost to Supply Homes to the Market?

R.S. Means Company data on physical construction costs are the foundation of our estimates of MPPC. This firm provides and sells estimates of the cost of providing units of different qualities across more than 100 American housing markets. Their data have been used by us (and others) in previous research.[13] Their cost estimates cover material, labor, and equipment for four different qualities of single family homes—economy, average, custom and luxury. No costs are associated with land (L), so their information pertains solely to CC in equation (1).

Means reports costs per square foot and provides estimates for different sized homes, ranging from 600$ft^2$to 3,200ft^2 of living area. Breakdowns are available by the number of stories in the house, and certain other characteristics such as the presence of a basement. We focus on costs associated with a smaller, modest-quality, one-story home of economy quality. Figure 1, which illustrates the type of home we are costing out, is taken from the most recent R.S. Means Company publication, *Residential Cost Data 2015*.[14] We choose this home because we believe

[11] Most recent models embed the idea that not all local residents will share the same goals, so that the regulatory environment will be shaped by the incentives and influence of different actors in the political process. Fischel (2001) is the most prominent advocate for the role of homeowners. They have a strong incentive to protect what often is their most important asset, against which they cannot fully insure against its decline in value. One obvious way to protect asset value is to restrict new supply. Another is to place restrictions to prevent negative spillovers from new development (which will make it more expensive and thereby reduce its supply). Theoretical analysis is much more challenging in a multi-community setting that permits sorting and strategic interactions. See the discussion in Gyourko and Molloy (2015) for more on this.

[12] A particular challenge is finding convincing instruments or some form of experimental variation. To see this more clearly, consider the variation in difficulty of building across space generated by geographic variables of the type analyzed by Saiz (2011). Unfortunately, both building difficulty and the presence of water are correlated with housing demand. Nearby water typically increases demand and a city is likely to be built in a challenging geographical environment only if the location has something else going for it. Consequently, geography provides meaningful variation in the difficulty of building, but is not a valid instrument for housing supply in most situations.

[13] For example, see Glaeser and Gyourko (2003, 2005), Glaeser, Gyourko and Saks (2005), and Gyourko and Saiz (2006)

[14] The R.S. Means Company presumes that a given quality home is constructed in a common way across markets. It divides the home into a number of different tasks that requires certain services, materials or labor. Means then surveys local suppliers and builders to determine the local price of those inputs. These costs are best understood

it best reflects the quality of the typical home (which is not new or very large) in most, if not all, markets. We have experimented with other qualities and discuss possible biases below.

The first important stylized fact about structure costs is that they are modest for an economy-quality home throughout the United States. The interquartile range runs from $72/sf^{2}to $86/ft^2, and the distribution is not fat-tailed. The 5th and 95th percentile values are $68/ft^{2}and $95/ft^2, respectively. Thus, in cheaper markets physical construction costs associated with putting up a typical home with 2,000ft^2 of living space are about $140,000 (~$70 per foot); in the most expensive markets, the costs are about $180,000 (~$90 per foot).[15]

A second noteworthy stylized fact is that real construction costs have not risen much over time. Figure 2 plots construction costs in constant 2010 dollars using R.S. Means Company national average data for economy-quality homes. This is an economically meaningful rise in the middle of the first decade of the 2000s, but real prices in 2015 are not materially higher than they were in 1980. This is consistent with much previous research and implies that rising real house prices cannot be explained by higher construction costs (e.g., see Davis and Heathcote, 2004; Davis and Palumbo, 2008; and Gyourko and Molloy, 2015). Moreover, the supply of structure itself appears to be highly elastic, and it appears that builders can produce vastly different quantities of structure at roughly constant cost (Gyourko and Saiz, 2006).

Minimum profitable production costs (MPPC) are readily calculated once the costs of putting up the structure are known. Given the assumptions outlined above, they are nearly 50% higher than the Means construction cost numbers.[16] This suggests that an efficient housing market should be able to supply modest-quality, single-family housing with 2,000 ft^2 of living space for around $200,000 in low construction cost markets and for little more than $265,000 in the highest construction cost markets.

Is Housing Supplied or Priced at MPPC: What Do the Data Show?

We can compute house price-to-MPPC (HP/MPPC) ratios using different data sources on home values. Most of our results below use self-reported house prices from the micro data in the biannual *American Housing Survey* (*AHS*) which runs from 1985-2013. It reports data on

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as the price of providing structure when construction is done efficiently, which means providing several units at a time. One-off construction of custom homes in particular would be much more costly. See R.S. Means Company (2015) and Section 2 in Gyourko and Saiz (2006) for more on the underlying methodology.

[15] The highest quality—luxury--home of the same size costs almost double these amounts to construct according to the R.S. Means figures. What the firm calls as 'average' quality home costs about 25% more. Because R.S. Means presumes a standard national production technology, the cross sectional variation is the same across housing qualities. Gyourko and Saiz (2006) identify the extent of unionization in the construction industry, the level of local wages in general, and difficult topography as being the key supply shifters that account for the cross sectional variation in structure production costs.

[16] They are 1.46 times pure construction costs to be precise. Presuming that land is no more than 20% of total structure plus land costs implies it equals 25% of structure costs. The 17% gross profit margin gets multiplied by 1.25 times construction costs for 1.46 (1.17*1.25=1.46).

individual units and their occupants in 98 CBSAs, which are listed in Appendix I.[17] These markets contain approximately 75% of the urbanized population in the United States according to 2010 Census data and include virtually any market of significant size.[18]

The strength of the *AHS* is that it contains micro data, clearly identifies single-family detached units, and reports the square footage of living area. The latter is useful as it allows us to match units of different sizes with the appropriate construction cost in the R.S. Means Company data.[19] We do this for homes of 600, 800, 1000, 1200, 1400, 1600, 1800, 2000, 2400, 2800, 3200, 3600 and 4000+ square feet of living area. Specifically, if a house is reported to be less than or equal to 700 square feet of living area, this is matched to R.S. Means Company costs per square foot for a 600 square foot, economy quality home.

Each single family home with non-missing living area data is matched with cost data from R.S. Means and then grouped into one of four bins: (a) HP/MPPC<0.75, which implies that market value of the house is at least 25% below our estimate of reproduction costs; (b) 0.75<HP/MPPC<1.25, which we interpret to be the range within which one cannot sensibly argue that prices are materially different from minimum profitable production costs, given the various underlying assumptions; (c) 1.25<HP/MPPC<2, which implies the house is from 25% to 100% above production costs; and (d) HP/MPPC>2, which implies that prices are more than double our estimate of production costs.

We chose these four, relatively wide, bins because they are likely to be robust to the measurement error involved in the construction of our ratios. That is, we are confident that a house is very expensive compared to minimum profitable production costs if it is at least 25% above our estimate of MPPC. We do not feel confident enough to reject that HP=MPPP for prices that are within 25% of MPPC, and so forth.

Table 1 reports our baseline results, which include data dating back to 1985 and extending to 2013. As of 2013, slightly less than three-quarters of all observations (73.6%) are priced near or below minimum profitable production costs, with more than half of them being valued more than 25% below MPPC. This leaves just over one-fourth (26.4%) living in expensive housing by our metric, with 10% of the underlying sample living in homes estimated to be more than double minimum profitable production costs.

Initial insight into the underlying spatial distribution of these units can be gleaned by restricting the sample to the highest price markets. If we redo the analysis with our baseline assumptions on

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[17] While the boundaries are those associated with the CBSA definitions, we use the term metropolitan area in the text below as indistinguishable from a CBSA.

[18] While a true census obviously would be preferable, we could not calculate a truly national HP/MPPC ration even with *American Community Survey* (ACS) data because construction costs are not reported by R.S. Means for each market in the country. No such data are available for rural areas either. The *ACS* also does not report anything on unit size, so we would have to assume a given size when comparing prices to reproduction costs. That would introduce substantial measurement error and noise to our estimates. We did experiment with the median priced-unit from the 2014 *ACS* in computing price-to-cost ratios like those discussed immediately below. Those findings are very similar in quality and quantity to those reported below using the *AHS*.

[19] Smaller units have higher per square foot costs, typically.

observations only in markets in the top quintile of the distribution of prices (as determined by median self-reported value[20]), a much higher 54.3% of the observations are found to be in expensive housing that is more than 25% above our estimate of minimum profitable production costs in 2013. Another 32.6% of owners in these high priced markets live in units within 25% of MPPC, while only 13.0% report prices less than 75% of reproduction costs.

Among the least expensive four-fifths of metropolitan areas (which contains observations across 78 different markets), we find that only 11.9% of houses are valued at more than 125% of minimum profitable production cost. More than half (54.5%) of houses cost less than three-fourths of MPPC, with 33.7% near MPPC in value. In this large swath of urban America, the housing market is supplying units at quite reasonable prices, given all-in production costs.[21]

Given the inevitable measurement error arising from unobserved quality differences across households in the micro data, another useful way to examine the spatial distribution of affordability is at the metropolitan area level. We do so by looking specifically at the median HP/MPPC ratio in each market. If the underlying household occupies a home of the quality we are pricing, these results can be a very accurate reflector of the status of the typical homeowner in a market, even though we are not using all the underlying data. Table 2 reports the findings, which are based on using the median HP/MPPC ratio in each market for which we have at least 25 individual observations (i.e., only in markets for which we think the median has its appropriate meaning; this results in an unbalanced panel of markets, but the findings are not materially different if we restrict the data to the common set of MSAs for which we have at least 25 observations each survey year dating back to 1985).

Back in 1985 at the beginning of the *AHS* surveys, over 90% of our metropolitan areas had median price-to-cost ratios less than or near 1. Only five (6.4%) had medians above 1.25 (and there were none where price was more than double production cost). This latter figure is only

[20] In decreasing order of median self-reported value in 2013, these markets are San Francisco-Oakland-Hayward, CA, Urban Honolulu, HI, Santa Maria-Santa Barbara, CA, Washington-Arlington-Alexandria, DC-VA-MD-WV, New York-Newark-Jersey City, NY-NJ-PA, Los Angeles-Long Beach-Anaheim, CA, San Diego-Carlsbad, CA, Boston-Cambridge-Newton, MA-NH, Oxnard-Thousand Oaks-Ventura, CA, Vallejo-Fairfield, CA, Seattle-Tacoma-Bellevue, WA, Bridgeport-Stamford-Norwalk, CT, Trenton, NJ, Philadelphia-Camden-Wilmington, PA-NJ-DE-MD, Sacramento-Roseville-Arden-Arcade, CA, Denver-Aurora-Lakewood, CO, Baltimore-Columbia-Towson, MD, Raleigh, NC, Riverside-San Bernardino-Ontario, CA and Allentown-Bethlehem-Easton, PA-NJ.

[21] Table 1 highlights that where one is in the housing cycle also matters. For example, at the height of the last housing boom, the 2005 *AHS* data indicate that more than one-half of all observations were at least 25% more expensive than minimum profitable production costs. We also experimented with different housing quality assumptions in computing MPPC. Assuming the lowest quality that meets local building codes will result in misclassifying some observations as expensive, especially those living in elite suburbs. If we use the costs associated with what R.S. Means terms 'average' quality (one above economy quality), the share of observations classified as expensive (i.e., HP/MPPC>1.25) falls from 26% to 18%. Assuming the highest possible construction quality ('luxury' in R.S. Means terminology) is required to dramatically lower the estimate of expensive homes. In that case, the share of observations valued at more than 125% of MPPC falls to just over 6%. Thus, our conclusion that the vast majority of homes are priced near or below their full social costs of replication is robust to virtually any assumption we could make. To reject the related conclusion that there is a modest, but still economically meaningful, fraction of owners with homes priced well above minimum profitable production costs requires what we entertain an extreme assumption that everyone lives in a home of the highest construction quality possible.

one-third of the 21.5% reported in Table 1 using all the micro data, but we do not find this surprising given the measurement error issue associated with unobserved unit quality, especially for homes located in the most desired suburbs. As of the middle of the 1980s, in only a handful of markets concentrated in California and Hawaii (none were east coast markets that year) was the typical home expensive relative to minimum profitable production cost. We presume that this distribution largely characterized housing markets before that point as well, based on what we know from earlier census data (Glaeser, Gyourko and Saks, 2005; Gyourko, Mayer, and Sinai, 2013).

During the late 1980s boom, median prices shifted up relative to construction costs. By 1991, the share of metropolitan areas with median value-to-cost ratios below 0.75 had fallen to 24%, but another 59% had values reasonably close to 1. The share of metropolitan areas with median price-to-cost ratios greater than 1.25 nearly tripled to just over 17% (with three of those having prices more than double minimum profitable production costs—the Honolulu, Los Angeles, and San Francisco markets).

The bust that bottoms out by the mid-1990s shows that there was a slight reduction in the share of metropolitan areas with particularly high median value-to-cost ratios, but also a continuing decline in the share of areas with particularly low median value-to-cost ratios. While one-fourth of our sample had ratios below 0.75 in 1991, less than 14% did in 1997. Over the same time period, the number of metropolitan areas with median price-to-cost ratios over 1.25 fell from just over 17% to just under 14% (from 12 to 9 in absolute number). The mid-1990s seems to have been a time of compression of metropolitan area prices, just as it was the only period in recent decades in which income inequality also declined.

Between 1997 and 2007, median price-to-cost ratios in the most expensive markets rose dramatically. At the height of the boom in 2007, just over 48% of our metropolitan areas had median ratios with prices more than 25 percent above estimated reproduction costs, with well over one-third of those areas having price-to-cost ratios that were greater than two. In contrast, the share of areas with median price-to-cost ratios below 0.75 actually hit bottom in 2003, and started rising as the national boom built through 2007.[22]

The years following the global financial crisis saw a distribution of median price-to-cost ratios that looked much like the early 1990s. By 2013, only three markets had median price-to-cost ratios above 2—the same number as in 1991. Nearly 11% had prices between 125% and 200% of MPPC, which is only slightly lower than the analogous share in 1991. Median price-to-cost ratios were less than 0.75 in one-third of markets in 2013, which is higher than the 24% in 1991. This implies that in a substantial fraction of urbanized America, it would not pay to rebuild the typical home if it fell down today. Nominal prices have gone up in these areas since the late 1980s, but nominal construction costs have as well.

Looking over the full *AHS* sample period, perhaps the largest difference between 1985 and 2013 is that the share of metropolitan areas with median price-to-cost ratios above 1.25 has risen from

[22] One reason for this is that construction costs did go up prior to the peaking of the boom, but a significant number of metropolitan areas experienced only little real price appreciation during that time period.

6.4% to 15.4%. There are a modest, but growing number of markets in America in which the typical owner is living in a home that is priced substantially above minimum profitable production costs. These markets include some of the nation's most productive labor markets, so they are important for our future.[23]

A Closer Look at the Three Types of Markets Identified in the Data

Additional insight can be gained by examining each of the three types of housing markets documented in Tables 1 and 2 in more detail. The Detroit-Warren-Dearborn, MI, market is emblematic of a place in which home prices have been well under minimum profitable production costs for long periods of time. Graphically, this market is characterized in Figure 3. There is a kinked supply schedule of housing, with the vertical component reflecting the size of the current stock. The height of the supply schedule at that point is minimum profitable production costs. As we have shown elsewhere (2005), prices in this type of market were pinned down by MPPC in the past, when the market was growing. This is reflected in the intersection of supply and demand, D_1, which is on the horizontal part of the supply schedule. Following some type of negative shock to the demand for the market (e.g., fierce foreign competition for the domestic auto industry that was concentrated in Detroit), demand dropped sharply over time to D_2 and now intersects supply on its vertical component. Prices are below the full production cost of new housing because this intersection reflects the price of older housing. Because housing depreciates over time, it is worth less, all else constant.[24]

We should see very little new development occurring over this entire time period in this market, as developers are not able to earn normal profits. In particular, new development should not increase as the HP/MPPC ratio rises, as long as its level is below 1. That is precisely what we see in Figure 4's plot of the intensity of housing permitting activity over time for the Detroit area, along with the ratio of median price-to-cost over time. Annual permits as a share of market size as measured by the market's 2000 housing stock (left axis) are plotted in green. Note how little new housing is built—never more than 1% of the 2000 stock in any year. While this is a very low number if one thinks that homes in this market do not last more than a century on average, it is consistent with a median HP/MPPC ratio (plotted in red and measured on the right axis) that never materially exceeds 1, and is below 0.8 in most years. Detroit is a well-functioning housing market in the sense that developers are rational in not building much. They did not increase supply as prices rose during the national housing boom—because they still could not earn a normal entrepreneurial profit.

[23] The three markets with median HP/MPPC ratios above 2 are Los Angeles-Long Beach-Anaheim, CA, Oxnard-Thousand Oaks-Ventura, CA, and San Francisco-Oakland-Hayward, CA. Those with ratios between 1.25 and 2 are Baltimore-Columbia-Towson, MD, Boston-Cambridge-Newton, MA-NH, Denver-Aurora-Lakewood, CO, New York-Newark-Jersey City, NY-NY-PA, San Diego-Carlsbad, CA, Seattle-Tacoma-Bellevue, WA, and Washington-Arlington-Alexandria, DC-VA-MD-WV.

[24] Most Americans, not just those in declining markets, do not live in new units. More than seven million occupied housing units were built before 1919, constituting approximately 6.2 percent of the occupied housing stock. Over 30 percent of occupied units in 2014 were built before 1960 and so were more than 50 years old. There is a related literature on filtering that is beyond the scope of this essay.

The Atlanta market is a canonical example of the second type in which supply is highly elastic and demand always is strong enough keep prices at MPPC. This is the textbook example also depicted in Figure 3 in which demand intersects supply on its horizontal part. If demand grows by a little or a lot, a sufficient number of units is delivered so that developers cannot earn above normal profits. Figure 5 shows what happened to permitting activity in this market. New supply is highly volatile. Permitting intensity was running at 3% of market size in 1985, but then fell 50% by 1991, as the local economy declined. This was followed by a long building boom, as annual new supply more than doubled to nearly 4.5% of market size in 2005. The onset of the global financial crisis then saw permitting plummet to below 0.5% of market size by 2009, and it has only recently started to increase again in the Atlanta area. Amidst all this variation in new supply, the median owner's price-to-cost ratio never varies much from 1. This is consistent with the supply of housing being highly elastic and demand fluctuating about a horizontal supply schedule.

This is another well-functioning housing market from an economic perspective. Developers appear to be quite rational and are efficient in that they always appear able to deliver new homes at minimum profitable production costs no matter whether they are delivering a relatively large or small number of units. Of course, there still are poorer households in markets such as Detroit and Atlanta who cannot afford decent housing. Our point is that this is not due to some malfunction in the local housing market. The locus of the problem is in the labor market (or deeper in terms of education).

San Francisco represents the third and final type of market in which HP>>MPPC. This requires some type of inelasticity to supply, above the point of minimum profitable production costs. This is depicted in Figure 6, where strong demand (D_1) intersects an inelastic supply schedule well above where P=MPPC. If demand increases further to D_2, prices will rise even more above MPPC. For some reason, developers in this type of market cannot bring on new supply even though it looks as if they could earn super-normal profits if they did. Of course, prices can drop relative to MPPC in this market if demand falls from D_2 to D_1. The key point is that the quantity supplied never changes very much. Figure 7 then plots permitting intensity compared to HP/MPPC over time. Median house price has been well above MPPC in this market for the past three decades and reached dramatic heights at the peak of the last boom in 2005. Note that permitting activity did not increase at all over the 8-year span from 1997-2005 when the median price-to-cost ratio increased from below 2 to over 5. The ratio has fallen sharply from that peak, but remains a very high 2.84 as of 2013. The link between prices (relative to production costs) and new supply has been broken in this type of market.

San Francisco is a relatively high physical construction cost market, but that is not what makes its homes cost so much. The self-reported price associated with the median price-to-cost ratio in this market in 2013 is $800,000. That HP/MPPC=2.84 implies minimum profitable production costs of $281,690. Using the fact that MPPC=1.46*CC from Section II, we can further impute that physical construction costs for this unit were $192,938.[25] That leaves a 'free market' land price of $48,235. Stated differently, that is what we think the underlying land would cost in a relatively unregulated residential development market. Land and structure costs sum to $241,173 for this unit and the builder's 17% gross margin makes up the rest to get to $281,690. Because the scarce factor is land, not building materials or construction labor, what makes San Francisco housing so expensive is the bidding up of land values. Developers cannot actually earn super-normal profits on the margin. Our formula suggests that the land underlying this particular modest quality house cost about $490,000—roughly 10 times the amount presumed for MPPC calculations.[26]

Figure 8 confirms that San Francisco and Atlanta are, indeed, representative of their types. None of the markets with high HP/MPPC ratios built much at all since the turn of the century and all of the markets with ratios near one allowed plentiful new housing to be constructed in their markets. The only factor mitigating the strength of the negative relationship between price-to-cost ratio in 2013 and permitting activity since 2000 is the presence of markets in long-term decline clustered near the origin of the graph.

It also is the case that more expensive housing markets tend to be both more regulated and have more inelastic supply sides. The correlation of median house price in 2013 with the Wharton Residential Land Use Restrictiveness Index (which has a bigger value the more restrictive the regulatory environment) is about 0.5. This is very similar to the magnitude of the correlation with Saiz's elasticity measure (although of the opposite sign because his measure declines in value the more inelastic is supply).

Our data also show a marked increase in price dispersion across markets, which is consistent with the predictions of earlier research (e.g., see Gyourko, Mayer and Sinai, 2013). Figure 9 shows this with its kernel density plot of the distribution of median house prices in our CBSAs in 1985 and 2013. There is a much longer right tail in 2013 than there was three decades previously.

We close this section by noting the strong correlation between homeowner income and the degree of regulation in a market. Variation in the Wharton regulatory index or Saiz's elasticity can account for nearly 25% of the variation in the income of the owner of the median priced home in 2014 based on *American Community Survey* data. Given the aforementioned positive correlation between house prices and the degree of regulatory constraint, it is not surprising to find richer people living in more expensive homes. Of course, no causal relation is implied from a simple, bivariate correlation. However, this does link to one of the most important new

[25] This particular unit contained 1900 square feet of living area, so the per square foot cost of the presumed modest quality structure was just over $100. San Francisco is one of the most expensive construction cost markets in the United States.

[26] To see this, first subtract $192,938 in structure costs plus 17% of that figure ($32,799) from $800,000, leaving $574,263. This figure represents the cost of the land and the entrepreneurial return to that component of the home. Thus, $574,263/1.17 yields a a pure land cost of $490,823. Thus, to replicate this house would cost $490,823 for the land, $192,938 for the structure, and $116,239 to compensate the home builder for taking on development risk. Land is 61% of total house value and 72% of land plus structure costs exclusive of entrepreneurial profit.

implications of inelastic supply sides in coastal markets—the potential impact on the distribution of wealth. It is to that issue which we now turn.

III. The Impacts of Supply Restrictions: Household Wealth

Piketty (2014) focused much attention on increasing capital-to-income ratios in the U.S. and elsewhere. For example, he estimates that the ratio of the U.S. capital stock-to-GDP increased from 332 percent in 1970 to 410 percent in 2010, and that increases in the value of the housing stock accounts for 40 percent of this increase. Even more spectacularly, increases in housing capital account for 83 percent of the increase in the ratio of private capital-to-income between 1970 and 2010. As Rognlie (2015) has carefully documented, the net capital share increase in the post-World War II era due to housing was from 3% to 8% of domestic value added. If La Cava (2016) is correct in arguing that this general increase was largely due to supply constrained markets, then perhaps the right policy conclusion from Piketty (2014) is not redistribution, but deregulation of housing supply in cities from San Francisco to Paris.

The growth in the stock of housing capital relative to GDP is primarily about prices, not the physical supply of housing. Between 1973 and 2010, the average new home expanded from 1,660 square feet to 2,392 square feet, but this 44 percent increase is far less than the 100 percent increase in income over the same time period. Standard price indices such as the S&P/Case-Shiller Index or the Federal Housing Finance Agency (FHFA) housing price index, which use repeat sales and other methods to control rigorously for changing housing quality, still show impressive increases in prices in restricted markets, such as the 109 percent increase in real prices in greater San Francisco between 1991 and 2016.

For example, the unit underlying the median 1985 HP/MPPC value of 1.55 in San Francisco contained 1,300 square feet of living space and was reported to be worth $150,000 (in 1985 dollars; $324,000 in 2013 dollars given the 116% increase in the general urban price level between 1985-2013). Given our knowledge of construction costs and presuming a 17% gross builder's margin, we can impute a nominal raw land value of $66,284 for this unit ($143,279 in 2013 dollars) using equation (1) above. If we further presume that this owner kept the home and experienced the same 98% real increase reported for the median home in this market, the underlying land increased in value by just over $272,000 to about $416,000 (in 2013 dollars).[27] This is a near tripling of real land value for a long-term owner of a very modest house in San Francisco over the past three decades.

[27] The details of the calculation are as follows. The 98% real appreciation on the $324,000 value of the home in 2013 dollars yields a value of $641,520 in 2013. If we conservatively subtract the real value of construction costs times the builder's 17% gross margin, that leaves $486,416 in value. Presuming that 17% of that remainder somehow gets captured by a builder still leaves a land price of $415,742 in 2013. Subtracting off the $143,279 that the owner paid in 2013 dollars in 1985 yields the gain of $272,463. One could argue the gain is higher, as there is no 'builder' involved if the owner simply kept the property. One could argue over various assumptions and our point is not to provide a precise dollar figure. Rather, it is to show that a readily defensible, back-of-the-envelope calculation indicates that owners of modest properties in San Francisco in 1985 have seen more than a quarter million dollars of wealth come their way over the past three decades from land value appreciation that we believe is driven by binding land use restrictions.

Yet housing wealth is different from other forms of wealth because rising prices both increase the financial value of an asset and the cost of living. An infinitively lived homeowner who has no intention of moving and is not credit constrained would be no better off if her home doubled in value and no worse off if her home value declined. The asset value increase exactly offsets the rising cost of living (Sinai and Souleles, 2005). This logic explains why home-rich New Yorkers or Parisians may not feel as privileged as Piketty's wealth statistics suggest that they should. In the U.S., they can sell their apartment and move to a much cheaper southern market, but as long as they want to continue living in their old homes, sky-high housing values do them little good.

Even interpreting the impact of rising housing costs for potential buyers can be tricky because the source of the high housing costs determines its impact on well-being and personal finances. If higher housing prices reflect higher wages, then San Francisco may have become less affordable, but its residents are also richer. This logic leads Moretti (2013) to conclude that nominal wage inequality overstates true inequality, because the rich need to pay more for access to their well-paid labor markets. Diamond (2016), conversely, argues that high housing prices in educated metropolitan areas reflect the higher amenity values enjoyed by the rich, which implies that real inequality is actually higher than earnings inequality. More generally, if higher housing prices reflect more amenities, then buyers are no worse off, but if they reflect a greater demand for the same amenities, then buyers' welfare has fallen.

The easiest wealth comparisons are not between the same owner over time, but between owners and renters in the same metropolitan area, over the same time period. When housing costs rise, the owner is essentially hedged per Sinai and Souleles (2005). The renter, conversely, experiences rising housing costs and is poorer in real terms.

As owners tend to be older and renters are younger, the reduction in housing supply created an intergenerational transfer to currently older people who happened to have owned in the relatively small number of coastal markets that have seen land values increase substantially as their HP/MPPC values have risen over time. On a per owner basis, the value is considerable, but the number of markets is relatively small and many are not particularly populous. Only 10 CBSAs have HP/MPPC values above 1.25 in 2013, and they contained 58.8 million people and 22.9 million total housing units according to the most recent *ACS* data for 2014.[28] Even with the 31 million people and 12 million housing units in the huge New York City and Los Angeles markets, these ten areas contain only 23% of total urban population. This should not be surprising, as a key impact of building constraints is on entry. The reason these restrictions can be so effective is that people cannot enter without a place to live.

If this is to be visible in broader wealth data, we should see it among the relatively elderly and at the top of the distribution, not the bottom or middle. Net worth data are reported every three years in the *Survey of Consumer Finances (SCF)*, a publication of the Board of Governors of the Federal Reserve. We examined surveys running from 1983-2013 (the latest available). Each survey is designed to be nationally representative, while oversampling high-income

[28] Including two others with ratios above 1.2 (Austin-Round Rock, TX, and Bridgeport-Stamford-Norwalk, CT) only adds another 2.8 million people and 1.1 million housing units.

households.[29] The public use samples do not provide any geographical identifiers below the national level, so we cannot contrast what is happening to the distributions of wealth in high price-to-coast areas versus others. Unlike the macroeconomic statistics, which focus on home values, we present facts about home equity, which are home values net of mortgage debt.

Table 3 reports results for three different pairs of age groups. Each is roughly 30 years apart in age. For example, the top panel of Table 3 lists the housing net worth of 18-25 and 45-54 year olds in 1983 and 2013. We report values for the 50th, 75th, 90th, 95th and 99th percentile of the distribution.[30] The results show that the increase in housing wealth has appeared almost exclusively among the wealthiest, older Americans.

For younger adults between the ages of 18 and 24, the three decade period between 1983 and 2013 has not been good in terms of housing wealth. Comparing columns 1 and 3 of this panel shows that net housing worth (or home equity) is flat or declining throughout the wealth distribution of this group.[31] Up through the 90th percentile, there is virtually no housing wealth (on net) for this age group as of the 2013 survey. Moreover, the wealthiest members of this group actually have less housing wealth than their counterparts 30 years earlier.

The panel tells a different story for today's 45-54 year olds (who were in the 18-25 year old range in 1983)---if they are in the top ten percent of the wealth distribution for their age cohort. At the 50th and 75th percentiles, there have been substantial declines in real home equity values from 1983-2013. At the 90th percentile, real housing wealth has been flat for the past thirty years for 45-54 year olds, while it has gone up modestly at the 95th and 99th percentiles. The absolute values of the gains are from $50,000-$140,000.

The dispersion in net housing worth has grown over time among this older cohort. In 1983 for example, the 95th percentile home equity value was 4.05 times the median value ($353,190/$87,120~4.05); in the 2013 data, the analogous ratio is 13.33 ($400,000/$30,000). We do not know where wealthiest 5%-10% of 45-54 year olds live, but the data are consistent with local land use restrictions leading to wealth transfers to older households who were fortunate enough to buy before binding regulations were imposed.

The other two panels of Table 3 tell an even starker story. The second panel contrasts 25-34 and 55-64 years olds. Not only is this a clear match in age across the three decade period, but home ownership patterns typically are set by the time one is 35. For 25-34 year olds, real home equity declines through the 90th percentile of the distribution over the thirty-year period.

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[29] The *SCF* uses a broad definition of net worth that includes all financial assets as well as vehicles, boats, business interests, real estate holdings, mineral leases, antiques, and precious metals, among other non-financial assets. We follow the *SCF* definitions, except that we exclude the present value of defined-benefit pension payments, as these are very sensitive to small changes in the method of computation. We use the weights provided to account for the different selection probabilities as well as non-response patterns that vary across some observable characteristics.

[30] In doing so, we rank the observations by net worth and then divide into one hundredths. Given the aggregate sample size, there are 30-40 observations per percentile. We report the average of those observations.

[31] This is largely true for non-housing wealth, too. Only at the 99th percentile is non-housing wealth greater in 2013 than in 1983 for 18-25 year olds.

Real home equity declined for the median 55-64 year old, too, but there were gains for those in the upper half of that group's distribution. At the 90th percentile and above, we see sharper gains for 55-64 year olds. The 90th percentile had $95,000 more home equity in 2013 than in 1983 ($350,000 versus $255,361, columns 4 vs. 2); the analogous differences were $190,000 at the 95th percentile ($543,000 versus $353,190) and just under $800,000 at the 99th percentile ($1,500,000 versus $706,380). Something similar can be seen in the comparison between 35-44 and 65-74 year olds reported in the bottom panel of Table 3.

While the macroeconomic statistics of Piketty (2014) and others show startling increases in the ratio of housing wealth to GDP, the *Survey of Consumer Finance* by contrast, shows sharp home wealth increases only among the richest members of the oldest cohorts. These data are consistent with binding land use restrictions in a select group of markets leading to transfers to now older households who happen to have bought in those markets some decades ago. Unfortunately, we cannot identify the location of the underlying households in the *SCF*'s public use samples, so we cannot be confident that this rise in wealth is just about coastal markets. Given the potential magnitudes involved and the rising prices in many coastal markets since the latest data from 2013, this is an area in urgent need of more detailed research.[32]

In addition, the SCF data show that home equity has risen much more slowly than aggregate housing wealth, because rising mortgage levels have offset rising home values. Younger Americans are more likely to have paid for their homes using large mortgages than to have experienced large wealth increases.

Basic capitalization theory suggests that the big winners from the reduction in housing supply are a small number of older Americans who bought when prices were much lower. Many of them will pass this wealth along to their heirs, but even this will be offset somewhat if their heirs also choose to live in high priced, supply constrained metropolitan areas. Indeed, we suspect that much of the housing price appreciation has already vanished from the home equity line in housing balance sheets, because it has been turned into consumption by retirees who have moved away from America's priciest areas.

Wealth over the Housing Cycle

Great boom-bust housing cycles can be important redistributors of wealth, too, and housing supply is a critical factor determining the path of those cycles. Pfeffer, Danziger and Schoeni (2013) document that the median household in the *Panel Study of Income Dynamics* lost more than 50 percent of its wealth between 2007 and 2011, and that 83 percent of that loss came from real estate. Yet there are both winners and losers from housing cycles. Individuals who bought before the boom and sold before the bust experience large increases in wealth. Individuals who bought during the boom and held onto their homes, conversely, experienced significant declines in wealth, sometimes leading to mortgage default and personal bankruptcy. Wolff (2014) found that in 2010, 16.2 percent of homeowners under the age of 35 had negative home equity, but only 5.3 percent of homeowners between 55 and 64 had home negative home equity.

[32] Another reason why more research is needed to identify causality is that non-housing wealth is skewing in at least somewhat similar ways among the same groups noted above.

Housing supply shapes these wealth transfers because it partially determines the extent of a housing convulsion. Glaeser, Gyourko and Saiz (2009) show that the 1980s housing boom and subsequent bust largely bypassed places with elastic housing supply. In those years, buyers seem to have recognized that where it was easy to build, housing prices would never remain above construction costs for long. Consequently, the transfers of wealth that occurred during that boom were located primarily in places with restricted supply.

The boom of the 2000s also disproportionately impacted places with limited supply, yet there were some areas such as Phoenix and Las Vegas that experienced booms despite enjoying relatively elastic housing supply. Because it takes time-to-build, over-optimistic buyers can still bid prices up in such markets for a few years. Eventually, the glut of new building in Las Vegas generated one of the largest of America's housing busts. Nonetheless, Mian, Rao and Sufi (2013) show that wealth losses, and associated consumption declines, were higher in places where housing is less elastically supplied.

IV. The Impact of Supply Restrictions: Urban Labor Markets and Productivity

Rising prices represent a transfer from buyers to sellers, which is not itself obviously a welfare gain or loss. Yet constricted housing supply also generates a potentially profound distortion: people are unable to move into more desirable metropolitan areas. Hsieh and Moretti (2014) and Ganong and Shoag (2015) have raised the possibility that housing restrictions have led to a serious misallocation of labor that could have a serious adverse effect on U.S. GDP. Given the large differences in productivity between Las Vegas and San Francisco, it seems virtually certain that America's GDP would rise if San Francisco built more housing allowing more population to shift there from Las Vegas.

Rising GDP does not necessary imply rising welfare, and it is possible there are negative externalities from building in San Francisco that are larger than the externalities from building in Las Vegas. Certainly, the opponents of building believe that they are fighting for the local environment or historic quality of life. However, there is little evidence to suggest that the negative effect of an extra home in a constrained area is worse than the negative effect of an extra home in an unconstrained area. Moreover, estimates of the impact of added density on local housing prices show very modest effects, suggesting that quantity restrictions are too restrictive to maximize the total value of land in the area (Glaeser and Ward, 2009).[33]

To better understand the possible GDP gains from eliminating land use controls, it is useful to make simplifying assumptions, some of which can bias the calculation in ways that are discussed at the end of this section. One such assumption is that there are no differences in negative externalities across locations. Another is that construction costs are the same everywhere. We will also ignore amenity differences, so an absence of regulation means that housing costs will be equal and, hence, wages will also be equal across space.

[33] Land values are maximized with constant construction costs, when the gap between the mark-up over construction costs relative to price is equal to the absolute value of the elasticity of price with respect to density. Glaeser and Ward (2009) find that this gap is roughly ten times larger than the elasticity.

In this setting, the potential output benefits from reallocating a fixed amount of labor from low wage areas to high wage areas can be seen in Figure 10, which depicts demand curves for two areas. In the absence of land use controls, prices equalize across the two areas, which is shown in the point in the middle of the figure where the two curves meet. When housing supply is restricted, the price in the restricted area is higher than the price in the unrestricted area.

If we assume that the demand for housing comes only from local labor markets, then we can treat each of these lines as a transformation of the labor demand curve, which in turn reflects the marginal product of labor. The lost output from misallocation is then equal to the integral under the higher line from the restricted population level to the level that causes the lines to meet. This difference represents a classic deadweight loss triangle and there is a rectangle that represents the transfer to the owners of land in the more expensive area.

The output impact is 0.5 times the current wage gap squared divided by the sum of the slopes of the two curves (Harberger, 1971). Large welfare losses arise if wages fall only modestly with increases in population, or equivalently, that labor demand drops only modestly with changes in wages. Cobb-Douglas production functions tend to deliver particularly elastic labor demand curves, especially when capital is mobile, and consequently, they imply that even modest wages gaps imply both large population misallocations and welfare losses.

Following Hsieh and Moretti (2015), assume that most capital is mobile, and that the wage in city i, $Wage_i(L_i)$, where L_i refers to city i's employment, equals $Wage_i(L_0)\left(\frac{L_i}{L_0}\right)^{\frac{\gamma+\eta-1}{1-\eta}}$, where γ represents the share of labor in a Cobb-Douglas production function (assumed to be 0.65) and η is the share of fungible capital (assumed to be 0.25), which will move in response to labor. In that case, the elasticity of labor demand is -7.5. If the initial wage in the constrained city is 50 percent higher than the wage in the constrained city, and if the constrained city is initially one-half of the size of the unconstrained city, then the wage gap can only be closed if 87 percent of the population of the less productive area moves to the more productive area. The increase in output from this shift is huge: 40 percent of initial output in the less productive place.

The Cobb-Douglas structure with fungible capital implies that cities can grow enormously with only modest decreases in wages. Agglomeration economies would only further attenuate the downward impact of added population on earnings. Yet, as we will shortly discuss, the empirical literature on local labor demand tends to find that labor demand is far less responsive to wages than this Cobb-Douglas model would imply.

If we instead use a linear approximation so that wage $Wage_i(L_i)$ equals $Wage_i(L_0)\left(1-\frac{\alpha}{L_0}(L_i-L_0)\right)$, where α represents the inverse elasticity of labor demand, then the shift in population to equalize wages must equal $\frac{1}{8\alpha}$ times the population in the initially lower wage area. Since the initial wage gap was 0.5 times the wage in the low wage area, the output gain equals the current earnings in the area times $\frac{1}{32\alpha}$. This much smaller effect compared to the previous case emphasizes how assumptions about labor demand shape our conclusions about the welfare losses from distortions in labor supply.

Any empirical estimate of labor misallocation costs also should address the problem of omitted human capital. The average worker in Tulsa will not necessarily earn the average wages in

Silicon Valley by moving to San Jose. Any misallocation calculation will typically increase with the variance in perceived productivities, and the noise created by unobserved human capital heterogeneity will generally cause an overestimate of misallocation costs.

Housing costs can themselves be used to assess the heterogeneity in human-capital adjusted wages. If we have estimates of the cost-of-living in different areas, then spatial equilibrium theory (Rosen, 1976; Roback, 1979) suggests that this will reflect differences in human capital-adjusted compensation minus the value of local amenities.   If places with higher human capital-adjusted wages typically have lower amenities, because cities are more likely to form only if an area is either productive or nice or both, then these cost of living differences may underestimate the true heterogeneity of productivity.   If more productive people live in places with more amenities, then housing differences will also overestimate true productivity heterogeneity.

For our simple misallocation cost exercise, we will treat differences in payroll per worker as reflecting true differences in the marginal product of labor, but we recognize that this is likely to lead to an overestimate of the true gains from reallocating labor. Using our linear approximation, if there are a large number of areas with initial populations L_i and initial wage levels W_i, and we then move their populations to the point where their wages are equal to a constant $\widehat{w} = \sum_i L_i / \sum_i \left(L_i / F_L^i(L_i)\right)$, then the total gains from reallocation equal $\frac{1}{2\alpha} \sum_i L_i \left(F_L^i(L_i) - \widehat{w}\right)$.

Equalizing wages will generate a reduction in the total wage bill, and the output gain from reallocation will be proportionate to this total wage bill reduction.[34] Using the 2014 *County Business Patterns,* we can gauge the magnitudes of this quantity if we treat annual payroll per workers as synonymous with wage. We restricted our analysis to the 266 metropolitan areas with more than 50,000 workers. Assuming that α is low enough so that all areas maintain a positive population, equalizing wages would involve a total movement of $\frac{1}{\alpha}$ times 8 million workers, about $\frac{1}{\alpha}$ times 8 percent of the employees in that sample. The largest gainer would be New York City (an extra 2.2 million times $\frac{1}{\alpha}$ workers). The overwhelming majority of cities would lose population, because they have current wages that are below the equalizing wage of \$49,000.   Cities such as Orlando and Miami would lose particularly large numbers of workers, because they are large and relatively low wage. That these areas may benefit from high amenities illustrates a shortcoming of our approach.

The total output gain would be $\frac{1}{\alpha}$ times \$109 billion, relative to a total payroll of \$5.1 trillion in this sample. If we follow Hsieh and Moretti (2015) and assume that payroll is 65 percent of total output, this gain would represent $\frac{1}{\alpha}$ times 2.12 percent of total output. The Cobb-Douglas formulation used by Hsieh and Moretti (2015) implies a value of $\frac{1}{\alpha}$ of 7.5. This produces in our calculations, as in theirs, a large misallocation effect. Our calculations suggest reallocation could increase total output by over 15 percent of GDP, but this would be reduced somewhat since some metropolitan areas would hit their lower bound of zero population.

[34] This wage reduction is a feature of our approximation, not a general feature of reallocation models. Still, this calculation suggests that the elimination of land use barriers would primarily redistribute from landowners to employers (and ultimately to customers). In addition, we are ignoring the impact that higher output has on product demand, which is captured in Hsieh and Moretti (2015), which also pushes earnings and the benefits from better labor allocation upward.

Yet, the relatively large reaction of employment to wages implied by their Cobb-Douglas formulation is somewhat at odds with the empirical estimates of the link between wages and labor demand. For example, Beaudry, Green and Sand (2014) present city-level labor demand elasticities that seem matched to our needs. They find that a city-level labor elasticity of -0.3, which suggests that the overall impact is 0.7 percent of GDP. Their city-industry level estimates are larger (-1.0) and those would imply a misallocation cost equal to about 2 percent GDP. Past demand elasticities have typically range from -0.25 to -1.0 (Hammermesh, 1991), which suggests that two percent of GDP annually may be an upper bound on the gains from reallocation.

We have nothing to add to discussions about labor demand elasticities at the local level. As two percent of GDP is itself large, we believe that these exercises illustrate that the benefits of reducing local land regulations are likely to be sizable. And, if local labor demand is quite elastic, then the output gains may be far larger per Hseih and Moretti (2015).

Finally, one should keep in mind the likely biases from our simplifying assumptions. Amenity differences and heterogeneity in building costs will tend to reduce this figure, but our calculations reflect only an estimate based on entirely static factors. It is quite possible that Silicon Valley is about creativity as well as high wages, and more Silicon Valley residents could also mean more technological innovation and faster productivity growth. Such hypotheses are speculative, but they lean towards the conclusion that the longer term costs of keeping people away from the most dynamic parts of the U.S. economy will prove higher than our short-term calculation.

V. Conclusions

Housing supply shapes housing prices and the size of metropolitan areas. When supply is highly regulated, prices are higher and population growth is smaller relative to the level of demand. The regulation of America's most productive places seems to have led labor to locate in places where wages and prices are lower, reducing America's overall economic output in the process. The older, richer buyers in America's most regulated areas have experienced significant increases in housing equity. The rest of America has experienced little growth in housing wealth over the past 30 years.

Advocates of land use restrictions emphasize the negative externalities of building. Certainly, new construction can lead to more crowded schools and roads, and it is costly to create new infrastructure to lower congestion. Hence, the optimal tax on new building is positive, and not zero. Nevertheless, the relevant question is not whether new construction in one place generates a negative externality but rather whether the negative impact of building in that place is greater than the negative impact of building in the relevant alternative locality. Local land use regulations have never been based on such comparisons.

To illustrate this point, consider environmentally motivated restrictions on building in California. The environmental impact reviews that have been required for larger projects since the 1973 Friends of Mammoth case consider only the local environmental impact of a new project. Yet, denying a permit also creates an environmental impact because building elsewhere likely is a substitute for building in California. Glaeser and Kahn (2010) estimate that per household carbon emissions are far lower in California than elsewhere, primarily because of California's temperate climate. If California's restrictions induce more building in Texas and Arizona, which require far more artificial cooling, then their net environmental could be negative in aggregate. More generally, Glaeser and Kahn (2010) show that America restricts building more in places that have lower carbon emissions per household.

As yet, there is no consensus about the welfare implications of heightened land use controls. Any model-based assessment inevitably relies on various assumptions about the different aspects of regulation and how they are valued in agents' utility functions.[35] Empirical investigations of the local costs and benefits of restricting building generally conclude that the negative externalities are not nearly large enough to justify the costs of regulation (e.g., Cheshire and Sheppard, 2002; Glaeser, Gyourko and Saks, 2005; Turner, Haughwout and van der Klaauw, 2014). Adding in the costs from substitute building in other markets generally strengthens this conclusion. Presuming that some added utility results from the higher GDP researchers envision from efficient reallocation of labor does the same.

But if the welfare and output gains from reducing regulation are large, then why don't we see more policy interventions to permit more building in markets such as San Francisco? The great challenge facing attempts to loosen local housing restrictions is that the median voters in most communities do not see the upside from any particular new project. Existing homeowners do not want more affordable homes. They do not appear to believe the hedging argument of Sinai and Souleles (2005), so they want the value of their asset to cost more, not less.[36] They also may not like the idea that new housing will bring in more people, potentially from different socio-economic groups.

There have been some attempts at the state level to soften severe local land use restrictions, but they have not been successful. Massachusetts is particularly instructive because it has used both top-down regulatory reform and incentives to encourage local building. Massachusetts Chapter 40B provides builders with a tool to bypass local rules. If developers are building enough formally-defined affordable units in unaffordable areas, they can bypass local zoning rules. Yet localities still are able to find tools to harness local construction, and the cost of providing price-controlled affordable units lowers the incentive for developers to build.[37] Massachusetts has also tried to create stronger incentives for local building with Chapters 40R and 40S. These parts of their law allow for transfers to the localities themselves, so builders are not capturing all the benefits. Even so, the Boston market and other high cost areas in the state have not seen meaningful surges in new housing development.

This suggests that more fiscal resources will be needed to convince local residents to bear the costs arising from new development. Perhaps the federal government could provide sufficient resources, but the political economy of the median taxpayer in the nation, who lives in a market

[35] See Gyourko and Molloy (2015) for more detailed discussion of the different modeling approaches taken in the literature.

[36] If they are financially constrained, as many no doubt are, this is perfectly rational, of course.

[37] It is difficult to assess the overall impact of 40B, especially since both builder and community often face incentives to avoid building "affordable" units. Standard game theoretic arguments suggest that 40B should never itself be used, but rather work primarily by changing the fallback option of the developer.

where HP/MPPC<=1, effectively transferring resources to much wealthier residents of San Francisco seems challenging to say the least. However daunting the task, the potential benefits look to be large enough for economists (and others) to keep trying to devise a workable policy intervention.

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Figure 1: One Story, Economy Quality, Single Family Home (R.S. Means Company)

RESIDENTIAL	Economy	1 Story

- **Mass produced from stock plans**
- **Single family — 1 full bath, 1 kitchen**
- **No basement**
- **Asphalt shingles on roof**
- **Hot air heat**
- **Gypsum wallboard interior finishes**
- **Materials and workmanship are sufficient to meet codes**
- **Detail specifications on page 19**

Note: The illustration shown may contain some optional components (for example: garages and/or fireplaces) whose costs are shown in the modifications, adjustments, & alternatives below or at the end of the square foot section.

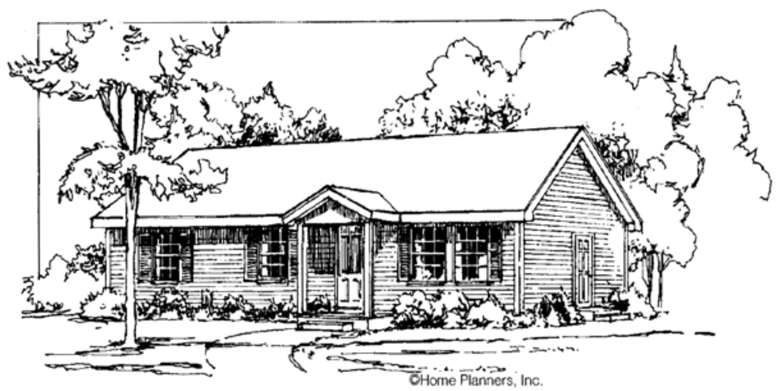
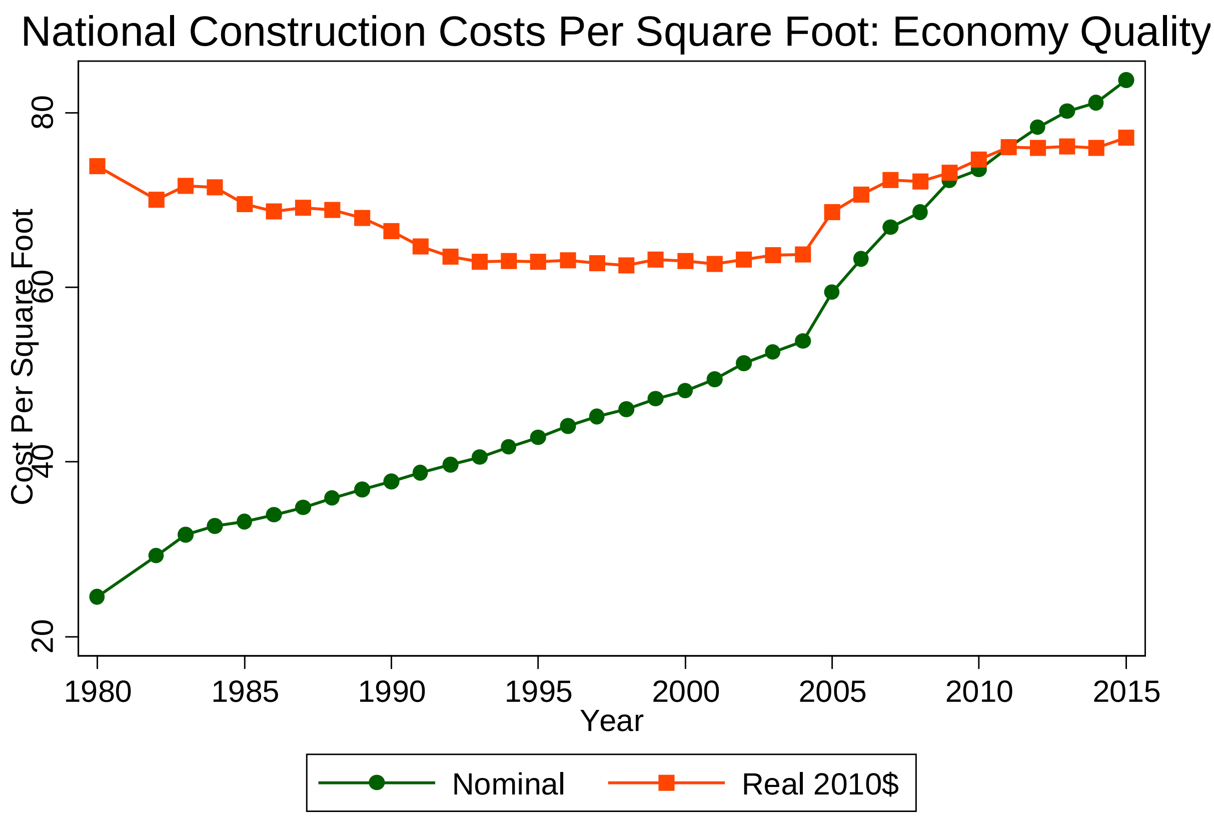


Figure 2: Real Housing Construction Costs: Economy Quality House Depicted in Figure 1
National Average Data



Source: R.S. Means Company (2015)

Figure 3: Kinked Supply Schedule from Durable Housing and Urban Decline

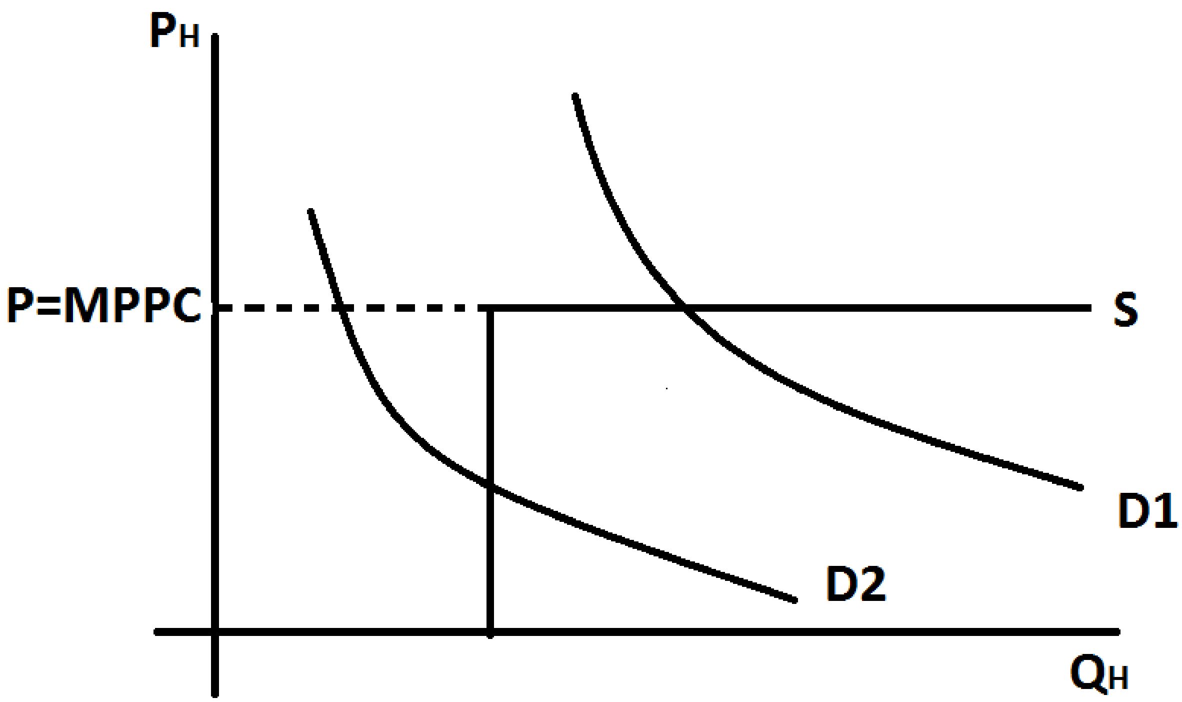
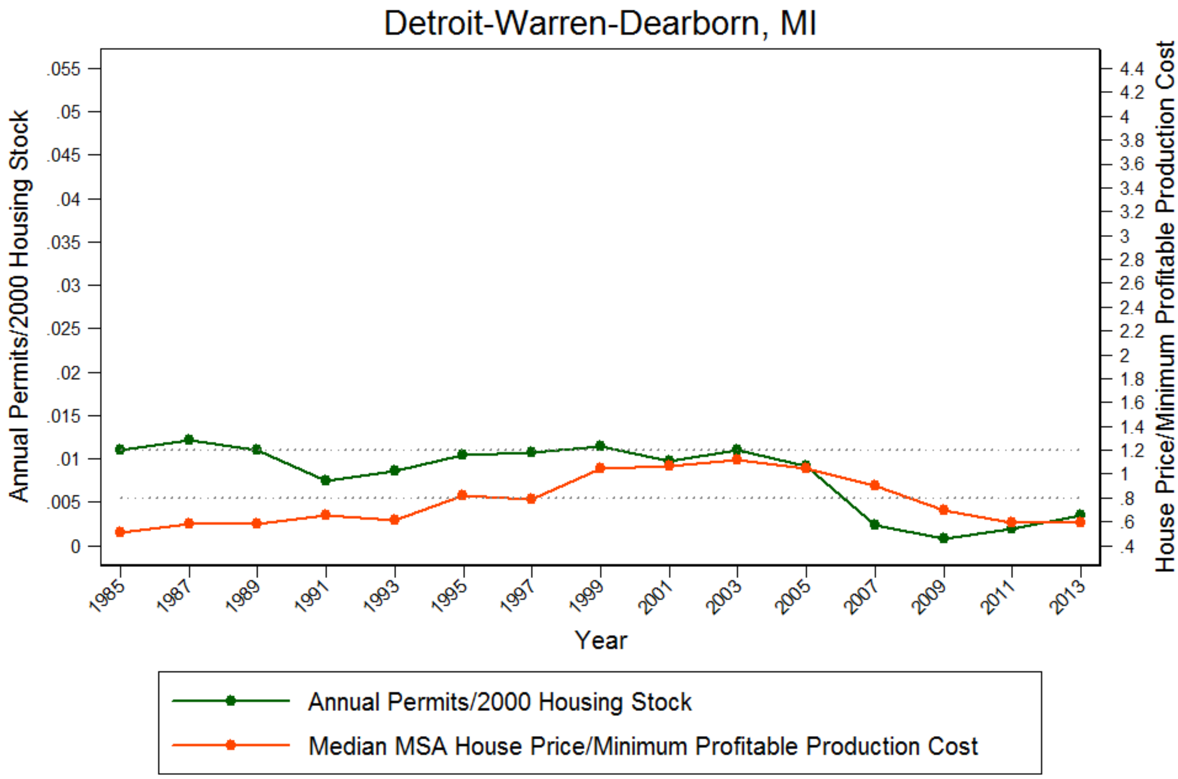
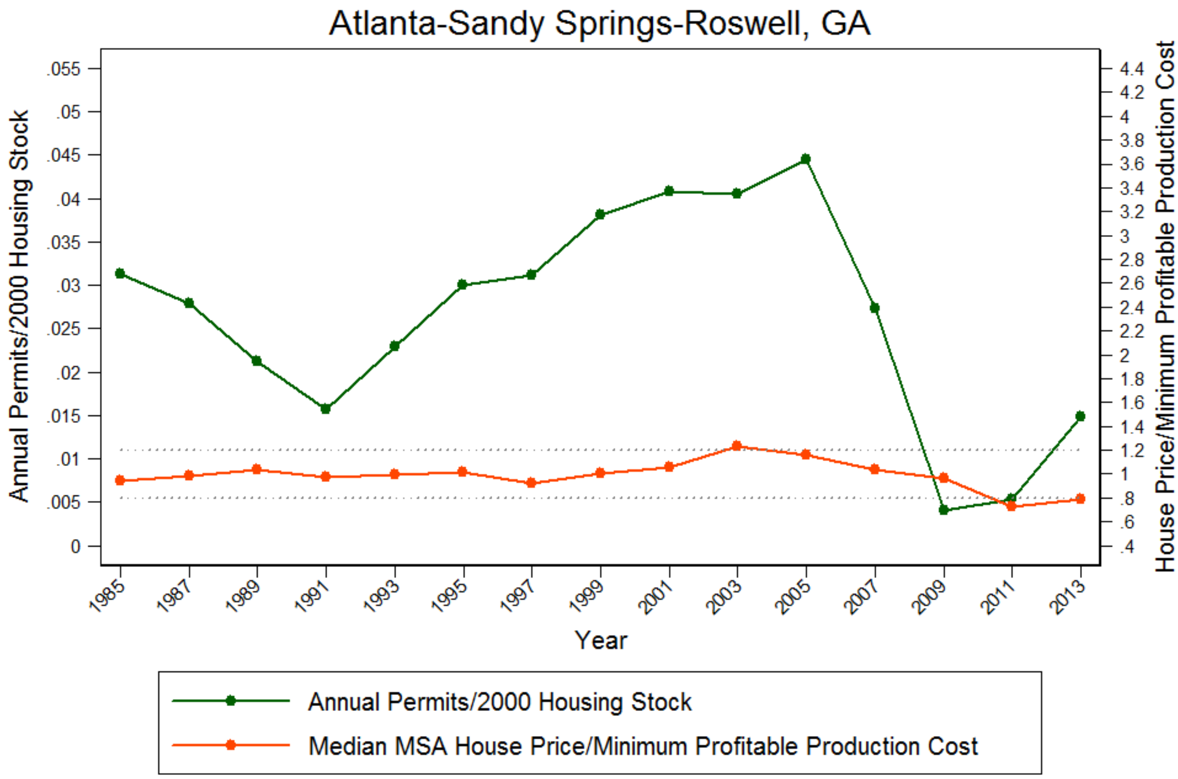


Figure 4: New Housing Supply and House Prices (Relative to Costs) in a Declining Market



House price are AHS micro data
MPPC are for 1800 sf, economy class, 20% land share and 17% gross margin homes

Figure 5: New Housing Supply and House Prices (Relative to Costs) in a Growing, Elastically Supplied Market: Atlanta



House price are AHS micro data
MPPC are for 1800 sf, economy class, 20% land share and 17% gross margin homes

Figure 6: Kinked Supply Schedule in Inelastically Supplied Market

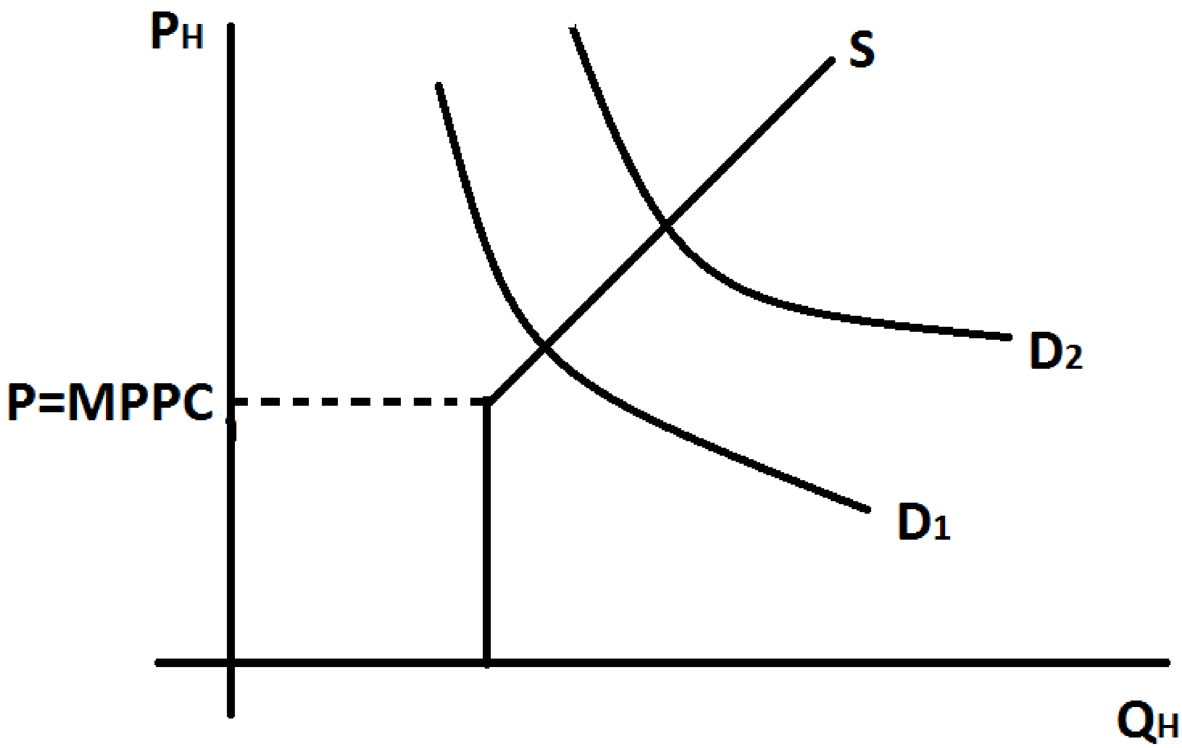
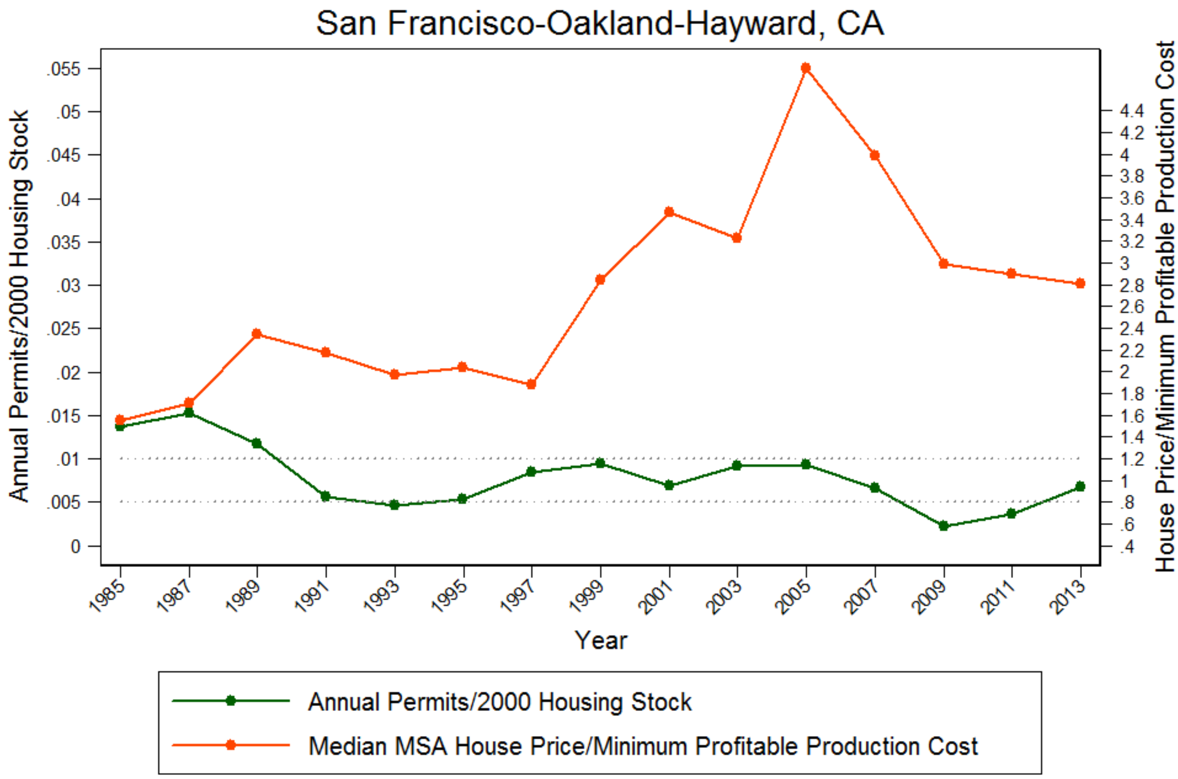


Figure 7: New Housing Supply and House Prices (Relative to Costs) in a Growing, Inelastically Supplied Market: San Francisco



House price are AHS micro data
MPPC are for 1800 sf, economy class, 20% land share and 17% gross margin homes

Figure 8: Price-to-Cost Ratios and Permitting Intensity, 2000-2013

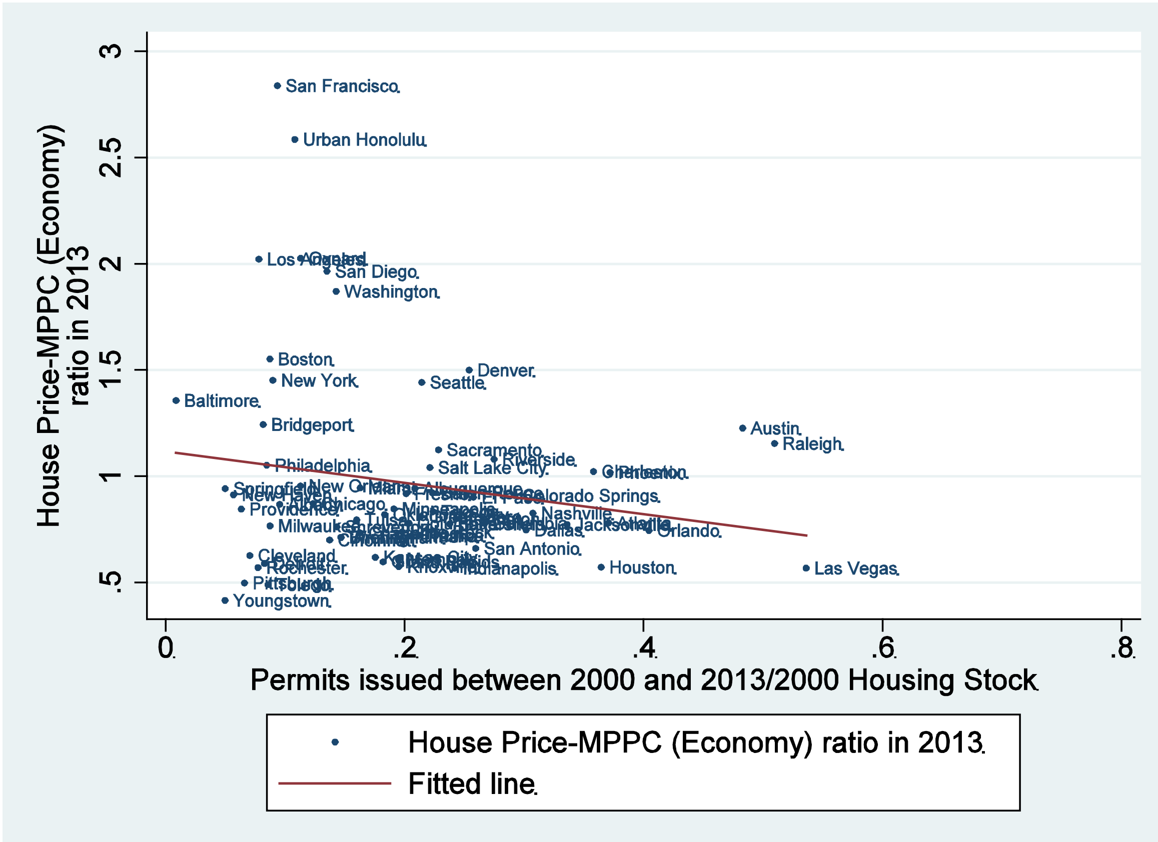
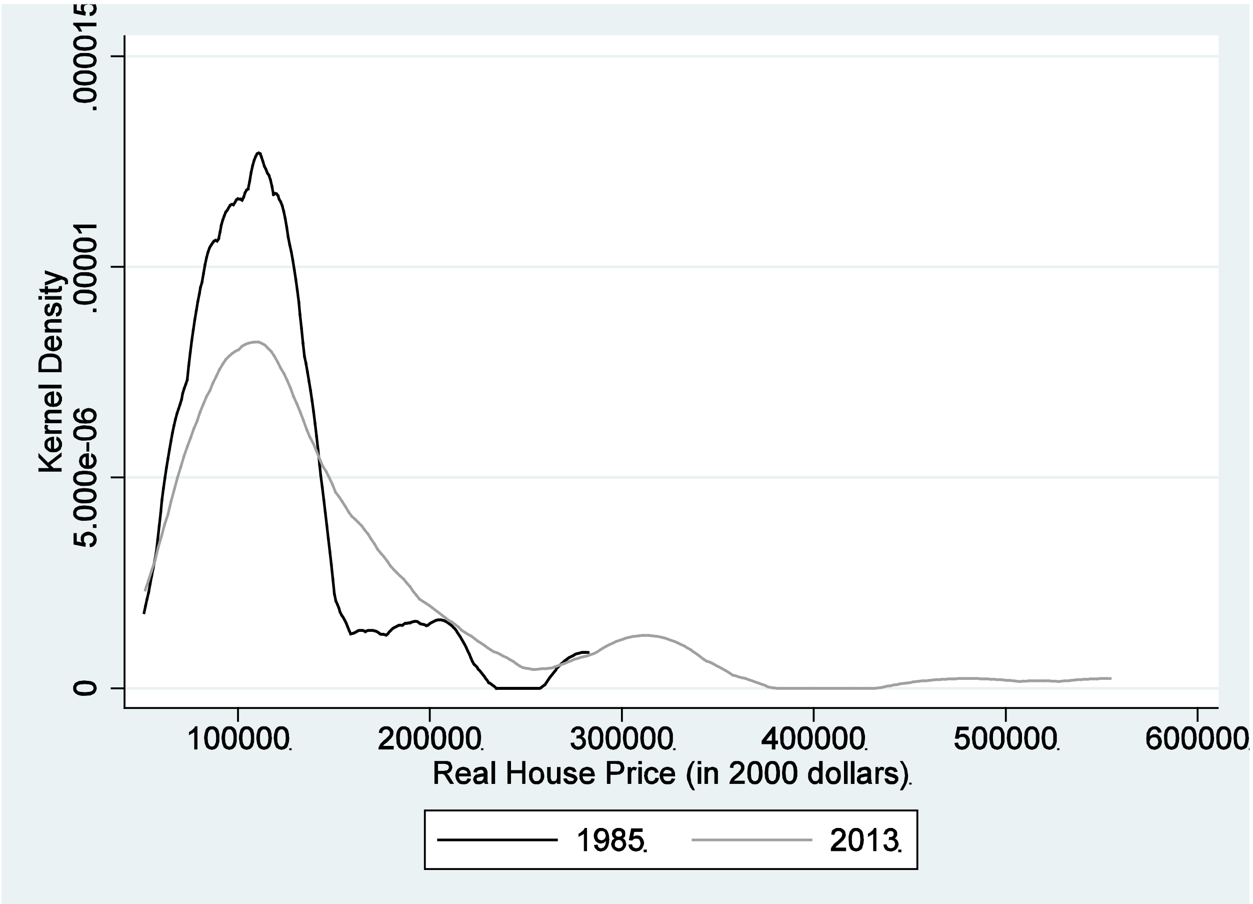


Figure 9: Increasing Dispersion in the Distribution of Real Median House Prices Over Time



Notes: Data are median self-reported prices from biennial AHS samples across the CBSAs listed in Appendix Table 1 that have at least 25 observations in a given year. See the text for details.

Figure 10: Welfare Consequences of Restricting Development in a Productive Market

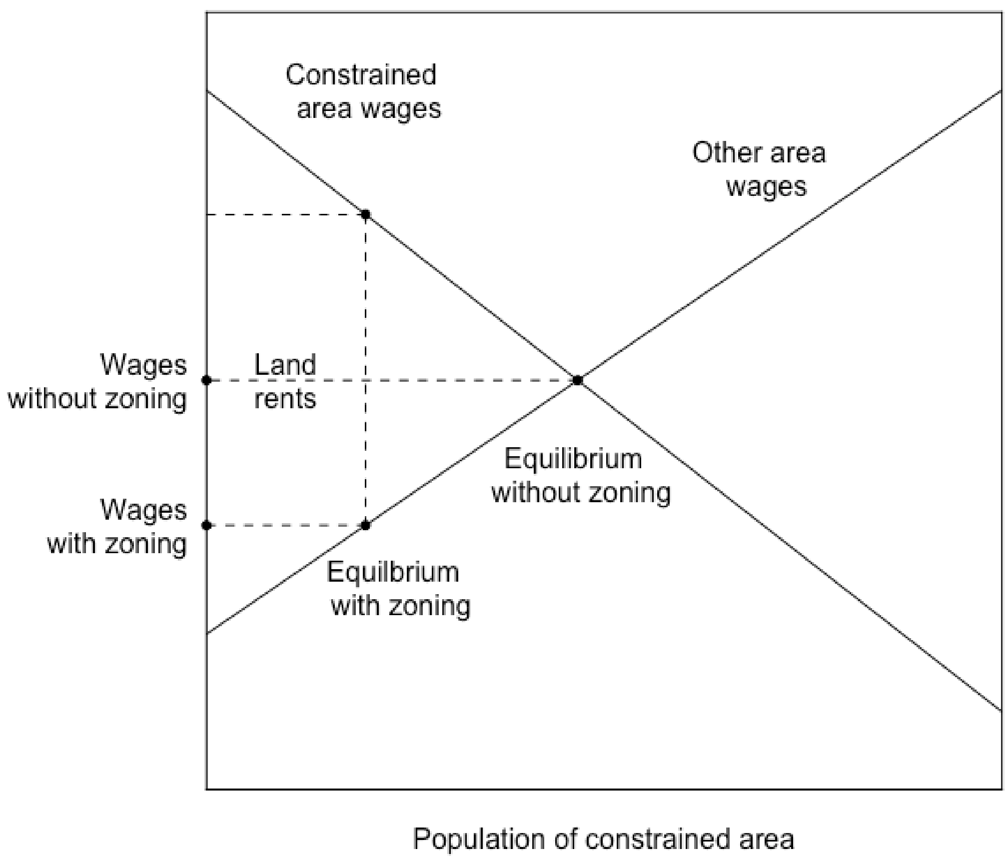


Table 1: House Price-to-Minimum Profitable Production Cost Ratio (HP/MPPC)
(Micro Data)

Year	P/MPPC <= 0.75	0.75<P/MPPC <= 1.25	1.25<P/MPPC <= 2	P/MPPC > 2
1985	38.0%	40.5%	17.9%	3.6%
1987	33.4%	38.3%	21.7%	6.6%
1989	31.8%	34.6%	20.3%	13.3%
1991	31.1%	35.3%	22.5%	11.1%
1993	31.8%	36.1%	23.6%	8.5%
1995	27.4%	37.7%	26.5%	8.4%
1997	31.5%	40.0%	23.0%	5.5%
1999	22.0%	40.1%	26.2%	11.8%
2001	19.4%	38.2%	25.2%	17.1%
2003	16.2%	32.1%	25.9%	25.9%
2005	18.0%	28.7%	25.3%	28.0%
2007	19.9%	28.1%	24.0%	28.0%
2009	31.4%	33.9%	21.6%	13.1%
2011	37.4%	35.4%	16.0%	11.2%
2013	40.3%	33.3%	16.2%	10.2%

Source: Authors' calculation uses American Housing Survey and R.S. Means Company data. See the text for details.

Table 2: House Price-to-Minimum Profitable Production Cost Ratio (HP/MPPC)
(Median Values, by CBSA)

Year	No. MSA	P/MPPC <= 0.75	0.75<P/MPPC <= 1.25	1.25<P/MPPC <= 2	P/MPPC > 2
1985	78	37.2%	56.4%	6.4%	0.0%
1987	72	29.2%	56.9%	13.9%	0.0%
1989	78	34.6%	50.0%	10.3%	5.1%
1991	70	24.3%	58.6%	12.9%	4.3%
1993	78	25.6%	61.5%	11.5%	1.3%
1995	69	18.8%	68.1%	10.1%	2.9%
1997	65	13.8%	72.3%	13.8%	0.0%
1999	68	7.4%	75.0%	14.7%	2.9%
2001	67	4.5%	70.1%	17.9%	7.5%
2003	69	4.3%	62.3%	23.2%	10.1%
2005	65	10.8%	44.6%	27.7%	16.9%
2007	64	10.9%	40.6%	29.7%	18.8%
2009	62	25.8%	50.0%	21.0%	3.2%
2011	64	28.1%	51.6%	15.6%	4.7%
2013	65	33.8%	50.8%	10.8%	4.6%

Source: Authors’ calculation uses American Housing Survey and R.S. Means Company data. See the text for details.

Table 3: Housing Net Worth – 30 Year Changes ($2013)				
	1983		2013	
Percentile	18-24 year olds	45-54 year olds	18-24 year olds	45-54 year olds
50	$0	$87,120	$0	$30,000
75	$0	$152,159	$0	$109,000
90	$24,803	$248,818	$5,500	$250,000
95	$47,488	$353,190	$43,000	$400,000
99	$141,808	$862,359	$95,000	$1,000,000
Percentile	25-34 year olds	55-64 year olds	25-34 year olds	55-64 year olds
50	$0	$94,184	$0	$60,000
75	$45,352	$161,886	$21,000	$167,000
90	$91,827	$255,361	$74,000	$350,000
95	$123,135	$353,190	$140,000	$543,000
99	$230,751	$760,380	$256,000	$1,500,000
Percentile	35-44 year olds	65-74 year olds	35-44 year olds	65-74 year olds
50	$55,799	$82,411	$6,000	$100,000
75	$118,660	$150,136	$58,200	$225,000
90	$180,763	$279,972	$168,000	$440,000
95	$247,349	$426,936	$300,000	$701,000
99	$531,198	$941,840	$1,025,000	$2,000,000

Notes: Data compiled from the 1983 and 2013 *Survey of Consumer Finances* using publicly available samples.

Appendix Table 1: CBSA List

CBSA Code	CBSA Name	CBSA Code	CBSA Name
10580	Albany-Schenectady-Troy, NY	33340	Milwaukee-Waukesha-West Allis, WI
10740	Albuquerque, NM	33460	Minneapolis-St. Paul-Bloomington, MN-WI
10900	Allentown-Bethlehem-Easton, PA-NJ	33660	Mobile, AL
12060	Atlanta-Sandy Springs-Roswell, GA	34980	Nashville-Davidson--Murfreesboro--Franklin, TN
12420	Austin-Round Rock, TX	35300	New Haven-Milford, CT
12540	Bakersfield, CA	35380	New Orleans-Metairie, LA
12580	Baltimore-Columbia-Towson, MD	35620	New York-Newark-Jersey City, NY-NJ-PA
12940	Baton Rouge, LA	36420	Oklahoma City, OK
13820	Birmingham-Hoover, AL	36540	Omaha-Council Bluffs, NE-IA
14460	Boston-Cambridge-Newton, MA-NH	36740	Orlando-Kissimmee-Sanford, FL
14860	Bridgeport-Stamford-Norwalk, CT	37100	Oxnard-Thousand Oaks-Ventura, CA
15940	Canton-Massillon, OH	37900	Peoria, IL
16700	Charleston-North Charleston, SC	37980	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD
16860	Chattanooga, TN-GA	38060	Phoenix-Mesa-Scottsdale, AZ
16980	Chicago-Naperville-Elgin, IL-IN-WI	38300	Pittsburgh, PA
17140	Cincinnati, OH-KY-IN	39300	Providence-Warwick, RI-MA
17460	Cleveland-Elyria, OH	39580	Raleigh, NC
17820	Colorado Springs, CO	40140	Riverside-San Bernardino-Ontario, CA
17900	Columbia, SC	40380	Rochester, NY
18140	Columbus, OH	40900	Sacramento--Roseville--Arden-Arcade, CA
19100	Dallas-Fort Worth-Arlington, TX	41620	Salt Lake City, UT
19340	Davenport-Moline-Rock Island, IA-IL	41700	San Antonio-New Braunfels, TX
19740	Denver-Aurora-Lakewood, CO	41740	San Diego-Carlsbad, CA
19820	Detroit-Warren-Dearborn, MI	41860	San Francisco-Oakland-Hayward, CA
21340	El Paso, TX	42540	Scranton--Wilkes-Barre--Hazleton, PA
22420	Flint, MI	42660	Seattle-Tacoma-Bellevue, WA
23420	Fresno, CA	43340	Shreveport-Bossier City, LA
24340	Grand Rapids-Wyoming, MI	44060	Spokane-Spokane Valley, WA
24660	Greensboro-High Point, NC	44140	Springfield, MA
26420	Houston-The Woodlands-Sugar Land, TX	45060	Syracuse, NY
26900	Indianapolis-Carmel-Anderson, IN	45300	Tampa-St. Petersburg-Clearwater, FL
27260	Jacksonville, FL	45780	Toledo, OH
28140	Kansas City, MO-KS	46060	Tucson, AZ
28940	Knoxville, TN	46140	Tulsa, OK
29820	Las Vegas-Henderson-Paradise, NV	46520	Urban Honolulu, HI
30460	Lexington-Fayette, KY	46700	Vallejo-Fairfield, CA
30780	Little Rock-North Little Rock-Conway, AR	47900	Washington-Arlington-Alexandria, DC-VA-MD-WV
31080	Los Angeles-Long Beach-Anaheim, CA	48620	Wichita, KS

32820	Memphis, TN-MS-AR	49340	Worcester, MA-CT
33100	Miami-Fort Lauderdale-West Palm Beach, FL	49660	Youngstown-Warren-Boardman, OH-PA