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THE IMPACT OF ZONING ON HOUSING AFFORDABILITY

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ABSTRACT

Does America face an affordable housing crisis and, if so, why? This paper argues that in much of America the price of housing is quite close to the marginal, physical costs of new construction. The price of housing is significantly higher than construction costs only in a limited number of areas, such as California and some eastern cities. In those areas, we argue that high prices have little to do with conventional models with a free market for land. Instead, our evidence suggests that zoning and other land use controls, play the dominant role in making housing expensive.

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I. Introduction

A chorus of voices appears to unanimously proclaim that America is in the midst of an affordable housing crisis? Andrew Cuomo asserted the existence of such a crisis in his introduction to a March 2000 report which documents the continuing, growing crisis in housing affordability throughout the nation. Indeed, Secretary Cuomo regularly justified aggressive requests for funding by pointing to this crisis. Pro-poor advocacy groups such as the Housing Assistance Council pepper their documents with assertions that "the federal government should commit to a comprehensive strategy for combating the housing affordability crisis in rural America." Trade associations such as the National Association of Home Builders decree that "America is facing a silent housing affordability crisis." The National Association of Realtors agrees: "there is a continuing, growing crisis in housing affordability and homeownership that is gripping our nation."

Does America actually face a housing affordability crisis? Are home prices high throughout the United States, or are there just a few places where housing prices become extreme? In those places that are expensive, why are home prices so high? Is subsidized construction a sensible approach to solving this crisis relative to other, deeper reforms? This paper examines whether America actually does face an affordable housing crisis. We then focus on why housing is expensive in high price areas.

In general, housing advocates have confused the role of housing prices with the role of poverty. Both housing costs and poverty matter for the well-being of American citizens, but only one of these two factors is a housing issue. Certainly, the country should pursue sensible anti-poverty policies, but if housing is not unusually expensive, these policies should not be put forward as a response to a housing crisis.[1] To us, a housing affordability crisis means that housing is expensive relative to its fundamental costs of

[1] This is not to say that housing vouchers might not be a sensible part of an anti-poverty program. However, if housing is not expensive, then these should be thought of as a response to poverty and not a response to a housing affordability crisis.

production, not that people are poor. As such, empirically we will focus entirely on housing prices, not on the distribution of income.

A second conceptual issue that is key in thinking about the existence of a housing affordability crisis is the relevant benchmark for housing costs. Affordability advocates often argue for the ability to pay (i.e. some percentage of income) as a relevant benchmark, but this again confuses poverty with housing prices. We believe that a more sensible benchmark is the physical construction costs of housing. If we believe that there is a housing crisis, then presumably the correct housing response will be to build more housing. However, the social cost of that new housing can never be lower than the cost of construction. As such, for there to be a "social" gain from new construction it must be the case that housing is priced appreciably above the cost of new construction.

This argument is not meant to deny that the existence of poor people who cannot afford housing is a major social problem. However, if housing does not cost appreciably more than the cost of new construction, then it is hard to think why policies oriented towards housing supply would be the right response to this problem. Hence, we focus on the gap between housing costs and construction costs.

To look at the housing affordability issue, we use the R.S. Means Company's data on construction costs in various U.S. metropolitan areas (hereafter, the Means data). This data gives us information (based on surveying construction companies) on costs of building homes of various characteristics. As a basic number, the Means data suggests that construction costs for the lowest of the four quality types they track (termed an economy home) are about $60 per square foot. Construction costs for the next highest quality type (termed an average home) are about $75 per square foot. Ultimately, we compare this information with data on housing prices.

To get a better sense of the distribution of housing prices throughout the U.S., we will turn to the *American Housing Survey* (*AHS*), but for a quick look at the affordability issue it is useful to examine the 2000 Census. The Census reports that the self-reported median home value is $120,000.[2] Sixty-three percent of single-family detached homes in America are valued at less than $150,000. Seventy-eight percent of these homes are valued at less than $200,000. The *American Housing Survey* reports that the median size of a detached owned home is 1704 square feet. Using the construction costs of an average home, this implies that this home should cost about $127,500 to build, with a lower quality economy home costing $102,000 to construct.[3]

Together these numbers provide us with the first important lesson from housing markets. The majority of homes in this country are priced—even in the midst of a so-called housing affordability crisis— at close to construction costs. The value of land generally seems small—probably 20 percent or less of the value of the house. To us this means that America as a whole may have a poverty crisis, but its housing prices are basically being tied down by the cost of new construction. Unless state intervention can miraculously produce houses at far less than normal construction costs, such programs are unlikely to radically reduce the distribution of housing costs in America.

But if housing costs in the U.S. are so low, what about the horror stories? What about the tear-downs going for millions in Palo Alto? What about the multi-million dollar apartments in Manhattan? The *American Housing Survey* allows us to see the distribution of house prices across the country. In addition, this source improves on the census in that it provides much better information on housing characteristics. Thus, we can better compare the self-reported value of the house with the cost of building the home from scratch. When combined with the Means data, this source allows us to examine housing prices in a wide range of cities, as well as the gap between these prices and new construction costs.

These data suggest that America can be divided into three broad areas. First, there are a number of places where housing is priced far below the cost of new construction. These

[2] Goodman and Ittner (1992) document that self-reported values tend to be about seven percent higher than true sales prices.

areas are primarily central cities in the Northeast and the Midwest, such as Detroit and Philadelphia. These places were the subject of our previous work (Glaeser and Gyourko, 2001), and in these areas there is almost no new growth. In general, these places had significant housing price appreciation over the 1990s, but values are still below construction costs.

In large areas of the country, housing costs are quite close to the cost of new construction. These places generally have robust growth on the edges of cities where land is quite cheap. These areas represent the bulk of American housing, although they seem to be somewhat underrepresented in the *AHS*.

Finally, there is a third category of cities and suburbs where the price of homes is much higher than the cost of new construction. Manhattan and Palo Alto are two of these places. Indeed, many of these places are in California, but the 1990s saw an increase in the number of these areas in the Northeast and South as well. While there are a number of areas with extremely expensive homes, they do not represent the norm for America. However, both poor and non-poor people suffer from higher housing costs in such areas.

After first surveying housing costs within the U.S., we try to understand why the expensive places have such high housing costs. It is noteworthy that we do not focus on the housing demand side of this equilibrium. High cost places generally have either very attractive local amenities (great weather or good schools) or strong labor markets. The Rosen-Roback (1979, 1982) framework has proved useful in such studies, and one of us (Gyourko and Tracy, 1991) has previously worked in that area.

Instead, we focus here on the role of housing supply. What is it that creates places where the cost of housing is so much higher than the physical construction costs? We offer two basic views. First, there is the classic economics approach which argues that houses are expensive because land is expensive. According to this view, there is a great deal of

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[3] Another relevant question is to look at changes over time. The Census reports a significant (15 percent) increase in the median value of a home over the 1990s. However, when we look at repeat sales indices

demand for certain areas, and land, by its very nature, is limited in supply. As such, the price of housing must rise. Traditional models, such as the classic Alonso-Muth-Mills framework, take this view.

Our alternative hypothesis is that homes are expensive in high cost areas primarily because of government regulation, i.e. zoning. According to this view, housing is expensive because of artificial limits on construction created by the regulation of new housing. This view argues that there is plenty of land in high cost areas, and in principle new construction might be able to push the cost of houses down to physical construction costs. However, the barriers to building create a potentially massive wedge between prices and building costs.

We present three pieces of evidence that attempt to differentiate between these two hypotheses. First, we look at two different ways of valuing land. The first, classic way is to use a housing hedonic and compare the price of comparable homes situated on lots of different sizes. With these comparisons, we are, in principle, able to back out the value that consumers place on larger lots. Our second methodology is to subtract the construction cost from the home value and then divide by the number of acres. This gives us another per acre value of land that is implied by the home price. The first or hedonic methodology can be thought of as giving the intensive value of land—that is, how much is land worth on the margin to homeowners. The second methodology gives the extensive margin or how much it is worth to have a plot of land with a house on it.

The two hypotheses outlined above offer radically different predictions about the relationship of these two values. The neoclassical approach suggests that land should be valued the same using either methodology. After all, if a homeowner does not value the land on his plot very much, he would subdivide and sell it to someone else. The regulation approach suggests that the differences can be quite large. Empirically, we find that the hedonic estimates produce land values that often are about ten percent of the

which control for housing quality, there is much less increase over the 1990s.

values calculated with the extensive methodology. We believe that this is our best evidence for the critical role that zoning may play in creating high housing costs.

Our second empirical approach is to look at crowding in high cost areas. The neoclassical approach tells us that if these are areas with a high cost of land, then individuals should be consuming less land. The regulation approach argues that highly regulated areas will have both large lots and high prices. Our evidence suggests that there is little connection across areas between high prices and density. This again suggests the critical role of regulation.

Our third approach is to correlate measures of regulation with the value of housing prices. This approach is somewhat problematic because high values of land may themselves create regulation. Nonetheless, we find a robust connection between high prices and regulation. Almost all of the very high cost areas are extremely regulated—even though they have fairly reasonable density levels. Again, we interpret this as evidence for the importance of regulation.

As a whole, this paper concludes that America does not uniformly face a housing affordability crisis. In the majority of places, land costs are low (or at least reasonable) and housing prices are close to (or below) the costs of new construction. In the places where housing is quite expensive, zoning restrictions appear to have created these high prices.

One implication of this analysis is that the affordable housing debate should be broadened to encompass zoning reform, not just public or subsidized construction programs. While poor households almost certainly are not consuming the typical unit in areas with extremely high prices, we suspect that any filtering model of housing markets would show that they, too, would benefit from an increased focus on land use constraints by affordability advocates.

All that said, we have done nothing to assess the possible benefits of zoning (well discussed by Fischel, 1992, for example), so we cannot suggest that zoning should be eliminated. However, we do believe that the evidence suggests that zoning is responsible for high housing costs and, to us, this means that if we are thinking about lowering housing prices, we should begin with reforming the barriers to new construction in the private sector.

II. Housing Prices in the United States

We start with our analysis of housing prices across the U.S. This work follows the methodology of Glaeser and Gyourko (2001). In this paper, we use the *American Housing Survey* and the U.S. census to gather data on housing characteristics and values. We use the R.S. Means data for construction costs. We then create measures relating home prices to construction costs.

R.S. Means monitors construction costs in numerous American and Canadian cities. The Means Company reports local construction costs per square foot of living area. The Means data on construction costs include material costs, labor costs, and equipment costs for four different qualities of single unit residences. No land costs are included.[4]

The Means data contain information on four qualities of homes—economy, average, custom, and luxury. The data are broken down further by the size of living area (ranging from 600ft^2 to 3200ft^2), the number of stories in the unit, and a few other differentiators. We focus on costs for a one story, economy house, with an unfinished basement, with the mean cost associated with four possible types of siding and building frame, and that could be of small (<1550ft^2), medium (1550ft^2-1850ft^2), or large (1850ft^2-2500ft^2) size in terms of living area. Generally, our choices reflect low to modest construction costs. This strategy will tend to overestimate the true gap between housing prices and

[4] Two publications are particularly relevant for greater detail on the underlying data: *Residential Cost Data*, 19th annual edition, (2000) and *Square Foot Costs*, 21st annual edition (2000), both published by the R.S. Means Company.

construction costs. If the relevant benchmark is an average quality unit, not an economy quality unit, construction costs should generally be increased by about 20 percent.

The housing price data used in this paper to create the relationship between home prices and construction cost comes from the *American Housing Survey* (*AHS*). We focus on observations of single unit residences that are owner occupied, and exclude condominiums and cooperative units in buildings with multiple units even if they are owned.

Excluding apartments simplifies our analysis, but in some ways the connection between construction costs and home prices is easier with apartments. In general, the marginal construction cost of an apartment is the price of building up. For example, Means data indicate that the price per square foot of building in a typical high rise of from 8 to 24 stories was nearly $110 per square foot in New York City in 1999.[5] This implies that the purely physical costs of construction for a new 1500 square foot unit in New York City is about $166,500. Anyone familiar with the New York housing market knows that a large number of Manhattan apartments trade at many multiples of this amount.

Because house price will be compared to construction costs, and the latter is reported on a square foot basis, the house price data must be put in similar form. This is straightforward for the *AHS,* which contains the square footage of living area. For every single unit reported in the 1999 or 1989 *AHS,* we can then compute the ratio of house value to construction costs (as long as it is in an area tracked in the Means data).[6] From this, we can calculate the distribution of homes priced above and below construction costs and are able to do so for nearly 40 cities in both 1989 and 1999. We look at two measures—first the share of housing in the area that costs at least 40 percent more than new construction costs. These are the homes in the area where land is actually a significant share of new construction costs. If the appropriate benchmark is an economy

[5] See R.S. Means. *Building Construction Cost Data, 60th Edition, 2002.*
[6] The actual computation is more complicated, as adjustments are made to correct for depreciation, inflation, the fact that owners tend to overestimate the value of their homes, and for regional variation in the presence of basements. See the Appendix for the details. In addition, we also performed the analysis using the 1991 *AHS* and the results are virtually unchanged from those for 1989.

home, then for these homes land is about 40 percent or more of the value. If the appropriate benchmark is an average home, then for these homes land is approximately 20 percent of the value of the home. Our view is that homes below this cutoff are sitting on relatively cheap land. We also calculate the share of homes with prices more than 10 percent below the cost of new construction.

Table 1 shows the distribution of homes—relative to construction costs—for the nation as a whole and for the four main census regions. These data highlight that at last half of the nation's housing is less than 40 percent more expensive than economy quality home construction costs, or no more than 20 percent more expensive than average quality home construction costs. It also suggests that a large share of the nation's housing has its price roughly determined by the physical costs of new construction, as most of the housing value is within 40 percent of physical construction costs. That said, the regional breakdowns reported in Table 1 emphasize that much land in western cities looks to be relatively expensive.

Figures 1 and 2 give an overall impression of the underlying data. In Figure 1, for central cities, we have graphed the share of homes in the 1999 *AHS* with prices more than 40 percent above construction costs on the share of homes in the 1989 *AHS* with prices more than 40 percent above construction costs. The straight line in the figure is the 45 degree line. In Figure 2, we have repeated this for the suburban parts of the metropolitan areas.

Figure 1 makes two major points. First, there is a great deal of permanence in these measures. The correlation coefficient between the 1989 and 1999 measures is 82 percent. The average of this variable across central cities was 47.8 percent in 1989 and 50.2 percent in 1999, so it does not look like the 1990s was a watershed in housing price changes. Second, there is a great deal of heterogeneity across places. A number of places—primarily those in California—have almost no homes that cost less than 1.4 times construction costs. However, in a number of places almost all of the homes cost less than this benchmark.

Figure 2 makes similar points. The correlation between the 1989 and 1999 measures is lower, but remains high at 0.70. There is also heterogeneity across space in suburban areas, but in general these places are more likely to have land values that are substantially higher than construction costs. The unweighted mean across the 37 suburban areas was 61 percent in 1989 and 63 percent in 1999. We suspect that one reason for the higher fractions of expensive housing is that suburban homes are newer and are likely to be of high quality. A second reason is that suburban homes have more land and suburban land is more expensive.

The data by local area also are shown in Tables 2 and 3. These exhibits also report the share of the housing stock that is priced at least 10 percent below construction costs. Across the U.S., there are many areas with extremely cheap housing. However, in this sample only Philadelphia and Detroit have extremely large values of this measure in 1999.[7] We should also note that previous work we have done using the 1990 census suggests that there is more cheaper housing than indicated by the *AHS*. Our suspicion is that the Census is more representative, but we leave further examination of these discrepancies for later work.

However, our focus here is not on the cheap areas, but on the expensive ones. And, we believe that this data confirms that there are some areas of the country that do, indeed, have a dearth of affordable housing. Still, for much of the country prices are determined by new construction costs. As discussed in the Introduction, for us this means that there is not an affordable housing crisis in such areas. The problem there probably lies in the labor market, not the land market. We now turn to trying to understand why home prices are high in the areas that are expensive relative to construction costs.

III. Discussion: Demand for Land vs. Zoning

Housing prices are determined by both demand and supply concerns. High housing prices must reflect high consumer demand for a particular area. However, they must also reflect some sort of restriction on supply. Data from sources such as Means suggests that physical houses can be supplied almost perfectly elastically. As such, the limits on housing supply must come from the land component of housing. The usual urban economics view of housing markets suggests that the restriction on housing supply is the availability of land. Because land is ultimately inelastically supplied, this naturally creates a limit to the supply of new housing at construction costs. An alternative view is that land is itself fairly abundant, but that zoning authorities make new construction extremely costly. These costs can take the form of classic impact fees or more Byzantine approval processes that slow construction and put up costly hurdles to construction. Obviously, there could be some truth to both views. In this section, we provide an analytical framework for our attempts to empirically distinguish between the two views of limits on building: expensive land vs. zoning. Section IV then examines a variety of data to determine if the weight of the evidence more strongly supports one view over the other.

As noted above, we have decided to ignore the housing demand component of the housing prices. Two reasons underpin this decision. First, housing demand has been studied much more extensively than housing supply. A distinguished literature including Alonso (1964), Muth (1968), Rosen (1979) and Roback (1982) has considered the determinants of housing demand. Labor market demand and consumption amenities, such as weather and school, are both important causes of particular demand for some areas. We have little to add to these findings. Second, policy responses to housing prices are unlikely to change housing demand. Increasing supply is a much more natural policy response to high housing prices than reducing demand.

To clarify the issues, consider a jurisdiction with a supply of land equal to "A." Assume that the construction cost for a home is K—here, we are not interested in the margin of

[7] The Philadelphia numbers for 1989 are not typos. They reflect a small sample bias associated with the number of units with basements. This is a statistical oddity that does not show up in other samples,

interior space. The free market price of land equals p. We will represent zoning with a tax T on new construction. In principle, zoning could also work by limiting the total number of homes in the area to a fixed number or, equivalently, by constraining lot size to be greater than a given amount. As we assume homogenous residents, a minimum lot size and a constraint on the number of residents will be equivalent. Also, as we are not interested in the incidence of the policy, a tax and a quantity limit will yield the same outcomes.

As such, the supply price of building a house with L units of land will be K+T+pL. We will not generally directly observe either p or T. The sales price of the home will be denoted P(L), where P(L) refers to the price of a home with L units of land. In equilibrium P(L) must equal K+T+pL so P'(L)=p.

Our primary interest is in the relevant magnitudes of pL and T in creating expensive housing. We do not directly observe either p or T, but we do observe P(L) and K. As such, we can compute P(L)-K which gives us an estimate of T+pL. Using standard hedonic analysis, we can estimate P'(L), which is the amount the housing price increases within a given neighborhood as the amount of land rises. By estimating P'(L), we are implicitly estimating p—the implicit price of land. Even in communities where new houses are not being built, the hedonic value of land still gives us an implicit price of land. We can then compare p with (P(L)-K)/L which equals p+T/L. The difference between these two values gives us a sense of the relative importance of land prices and zoning controls.

A second test of the model requires us to look across communities with different levels of some local amenity that we denote as B. In this case, we write the home price function as P(L,B). If we differentiate across communities, and T changes across communities, but K does not, then $\frac{dP(L,B)}{dB} = \frac{dp}{dB}L + \frac{dT}{dB}$. The value of T might differ across communities because impact fees differ, but more likely T will differ if zoning takes the

whether in the *AHS* or decennial censuses.

form of quantity controls. If zoning takes the form of minimum lot size or maximum residents, then the implicit tax will be higher in high amenity communities. In a sense, our interest lies in determining the relative magnitudes of $\frac{dp}{dB}L$ and $\frac{dT}{dB}$. One way to examine this is to look at our implied measures of p and T found using the methodology discussed above.

Another way is to look at land densities. We specify utility as a function of the location-specific amenity B, consumption of land, and consumption of a composite commodity denoted C which is equal to income (denoted Y) minus housing costs. Thus, total utility equals U(B, L, Y-P(L,B)). This implies an optimal level of land, denoted L*, which satisfies $U_L = P'(L^*)U_C$ (where U_X denotes the derivative of U(.,.,.) with respect to an argument X). For simplicity, we will assume that U(B, L, Y-P(L,B)) equals W(B)+V(L)+Y-P(L,B), so the first order condition for land becomes V'(L*)=p. Differentiating this with respect to B then yields: dL*/dB=(dp/dB)/V"(L*). If V(L) equals vL^{α}, then this tells us that $Log(L) = \frac{Log(v\alpha)}{1-\alpha} - \frac{1}{1-\alpha}Log(p)$. This yields the clear implication that if dp/dB is big—we should expect there to be lower densities in areas with large amenities and high costs. Conversely, if there is no connection between housing costs and density, then this is more evidence for the zoning model against the neoclassical housing price model.

Our third empirical approach relies on the existence of zoning. If we have measures of the difficulty of obtaining building permits in a particular area, then we should expect them to drive up housing costs (holding B constant). This is just documenting that dP/dT>0. Obviously, this approach is likely to be compromised if high amenity areas impose more stringent zoning. Nonetheless, a connection between the strength of zoning rules and housing prices seems like a final test for the zoning view. As an added test, across communities, if we have measures of zoning controls, we would expect the estimated value of T/L to be higher.

IV. Evidence on Zoning: The Intensive Margin and the Extensive Margin

As our first test, we follow the framework and attempt to estimate "p"—the market price of land and T/L—the implicit zoning tax. Using data from the 1999 *American Housing Survey*, we begin by estimating "p" using the standard hedonic methodology in a regression of the following specification:

(1) Housing Price=p*Land Area + Other Controls.

The other controls include the number of bedrooms, the number of bathrooms, the number of other rooms, an indicator variable that takes on a value of one if the home has a fireplace, an indicator variable that takes on a value of one if the home has a garage, an indicator variable that takes on a value of one if the home is in a central city, an indicator variable that takes on a value of one if the home has a basement, an indicator variable that takes on a value of one if the home has air-conditioning, and the age of the home. We ran each regression separately for 26 metropolitan areas for which there were 100 observations so that trait prices would be reasonably precisely estimated.[8]

Column (1) in Table 4 reports the hedonic price of land for different metropolitan areas using this linear specification. The hedonic literature has generally argued that non-normal errors terms make a logarithmic specification more sensible. As such, we have also estimated logarithmic equations of the following form:

(1') Log(Home Price)=p'*Log(Land Area) + Other Controls.

To transform the estimate of p', which is an elasticity, into a value of land, we take this coefficient and multiply it by the ratio of mean home price to mean land area. After this transformation, our elasticity-based estimates should be comparable to those in column (1) and we report those in column (2).

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[8] There are 96 observations in the Baltimore metropolitan area, which is the smallest number across all cities. Visual inspection of the findings found sensible results for most traits when the number of observations was at or above 100.

The two hedonic estimates are strongly correlated (ρ=.5), although the implicit prices arising from the logged specification tend to be slightly higher. In any event, functional form does not lead one to materially different conclusions regarding the value of a small change in lot size about the sample mean in these areas. In general, the hedonic estimates suggest that land is relatively cheap on this margin. In some cities, the estimated price is below $1 per square foot. While estimates in those places tend not to be precise, the t-statistics reported still do not imply really high prices even at the top end of the 95 percent confidence interval. In places where the point estimate is reasonably precise, land prices tend to be between $1 and $2 per square foot. In these areas, this implies that an average homeowner would be willing to pay between $11,000-$22,000 dollars for an extra quarter acre of land.[9] The estimates are higher in some cities, primarily in California. For example, in San Francisco it appears that homeowners are willing to pay almost $80,000 dollars for an extra quarter acre of land.[10] While we do not have really good benchmarks with which to compare these prices, intuitively they seem reasonable to us as a whole.

To implement our first test, we then need to compare these prices with the implicit price of land found by computing the difference between home prices and structure costs. Subtracting structure costs (provided by the Means data) from reported home values and then dividing by the amount of land generates an estimate of "p+T/L" as described above—the value of land including the implicit tax on new construction. These average values of p+T/L for each metropolitan area are in column 3 of Table 4.

Comparing columns 1 and 2 with column 3 illustrates the vast differences in our estimates of the intensive and extensive prices of land, or p and p+T/L. In many cases, our estimate of p+T/L is about ten times larger than p. For example, in Chicago our imputed price of land per square foot from the extensive margin methodology is $13.16. This means that a home on a quarter acre plot (or 10,890 square feet) will cost over

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[9] There are 43,560 square feet in an acre of land.

$140,000 more than construction costs. In San Diego, this quarter acre plot is implicitly priced at nearly $285,000. The analogous figure is even higher in New York City at just over $350,000. And, in San Francisco the plot is apparently worth just under $700,000.

This is our first piece of evidence on the relative importance of classic land prices and zoning. In areas where the ratio is 10-to-1, the findings suggest that for an average lot, only 10 percent of the value of the land comes from an intrinsically high land price as measured by hedonic prices.

While the hedonic land prices from the linear specification (column 1) are not significantly correlated with mean house prices, both the hedonic prices from the logged model (column 2) and the extensive margin prices (column 3) are strongly positively correlated with mean prices. Simple regressions of each of the three land price series on mean house price finds that dollar impact of house price with respect to land price is far larger for the series that reflects the implicit development tax. Specifically, a one standard deviation increase in house price (which equals $82,239 in this 26 city sample) about its mean is associated with a $13.82 increase in land price as reflected in our p+T/L measure. The analogous standardized effect with respect to our measure of p arising from the logged hedonic model is $1.10.[11] While these results are based on an admittedly small sample, we believe the difference in the scale of the changes provides evidence consistent with the hypothesis that high home prices appear to have more to do with regulation than with the operations of a free market for land.

V. Evidence on Zoning: Density and Housing Costs

Our second test is to look at the connection between housing prices and density. As described in the model, the neoclassic land model strongly suggests that there should be a positive connection between density and housing prices. The free land market view

[10] The estimate from the linear specification is much lower, but logging materially improves the overall hedonic in the case of San Francisco.

suggests that higher amenities will lead to higher land prices and lower consumption of land. The zoning view suggests that higher amenities will just lead to a higher implicit zoning tax. This zoning tax does not impact the marginal cost of additional land and, therefore, there should be little connection between the cost of land and density.

To test this implication, we correlated land density within a central city with our various measures of housing prices within that city. As the framework suggested the relationship $Log(L) = \frac{Log(v\alpha)}{1-\alpha} - \frac{1}{1-\alpha} Log(p)$, we will estimate a logarithmic equation. We use as our land area measure the logarithm of the land area in the city divided by the number of households.[12] Obviously, density is higher the lower the value of this variable.

Table 5 presents the results from a series of regressions exploring the relationship of our density measure to the index of expensive homes and land in our sample of cities. In regression (1), we use our measure of the share of houses that cost at least 40 percent more than construction costs as the independent variable. In this case, the relationship is negative so that a higher concentration of expensive homes is associated with greater density. However, there still is no meaningful statistical relationship. Figure 3 plots the relationship with the regression line included. The figure highlights the extraordinary amount of heterogeneity in the relationship between density and the distribution of house prices. For example, Detroit, Seattle, and Los Angeles have similar land densities per household, but radically different fractions of units sitting on expensive land. Analogously, New York City and San Diego have similarly high fractions of expensive land, but very different residential densities.

In regression (2), we control for median income in the city in 1990 to control for the possibility that richer people live in expensive areas and demand more land. However, there still is not a really strong relationship between density and the fraction of expensive

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[11] The coefficients are precisely estimated in the underlying regressions and are available upon request. Because the hedonic land price arising from the linear model is virtually uncorrelated with mean house price, the analogous impact is near zero for that land price series.
[12] Using population per square mile yields similar results.

land and homes. Density is slightly higher in more expensive areas on average, but the relationship is tenuous even when controlling for income. In regression (3), median house price in 1990 is used as the independent variable. There is a statistically significant negative relationship between density and price in this case, with the elasticity being –0.56. However, there is much heterogeneity here, too, as the statements made just above regarding Detroit, Seattle, Los Angeles, New York City, and San Diego still hold true when median price is on the right-hand side of the regression.

For regressions (4), (5) and (6), we take the model more seriously and use an amenity to look at the impact of housing costs and land consumption. We focus on a particularly well-studied amenity—average January temperature. In regression (4), we show that there is a strong positive relationship between the fraction of expensive homes and land and average January temperature. This relationship is necessary for this variable to qualify as an amenity. In regression (5), we regress the logarithm of land area per household on January temperature. In this case, the relationship is much less strong. The t-statistic is 1.6. Taken together, these results show that warmer January temperature may raise housing prices[13], but there is no strong evidence that it increases densities—at least, not by very much. Indirectly, this suggests that it is not raising the marginal cost of land by much.

In regression (6), we follow the spirit of the framework most closely. We regress the logarithm of land area per household on the distribution of housing prices using average January temperature as an instrument. January temperature is meant to represent the exogenous variation in amenities that causes prices to rise. Not only is there no statistically meaningful connection between prices and land consumption, but these instrumental variables results imply that higher prices are associated with lower, not higher, densities. One possibility is that incomes are higher in these areas and that richer people are demanding more land. Consequently, we redid the analysis adding median family income as a control, but the results were largely unchanged. That is, there is no

[13] There is a statistically and economically significant positive relationship between mean January temperature and median house price. Those results are not reported here, but are available upon request.

statistically significant relation between instrumented prices and density, and the point estimate still is slightly positive (albeit small). While we acknowledge that the sample is small and that there could be other omitted factors, these results suggest to us that higher prices have more to do with zoning than a higher marginal cost of land.

As a final test of this view, we regressed our two measures of land costs from Table 4 with average January temperature. We only have 26 observations, but the results are still quite illuminating. A standard deviation increase of 14.7 degrees in mean January temperature is associated with a $5.02 higher construction cost-based price of land. The same increase in warmth is associated with only a $0.47 higher hedonic-based price of land.[14] Once again, amenities seem to have more of an effect on the implicit zoning tax than on the marginal cost of land.

VI. Evidence on Zoning: Housing Costs and Zoning

Our last perspective on the role of zoning comes from an examination of the correlation between land prices and measures of zoning. Such data are very difficult to obtain. Our measures of zoning come from the *Wharton Land Use Control Survey*. This survey took place in 1989 and is a survey of jurisdictions in 60 metropolitan areas. Because of the limits of our *American Housing Survey* data, we are forced to consider only observations on the central cities of 45 metropolitan areas.

The variable we focus on here is a survey measure of the average length of time between an application for rezoning and the issuance of a building permit for a modest size, single family subdivision of less than 50 units. This measure can take on values ranging from one to five with a value of one indicating the permit issuance lag is less than three months, a value of two indicating the time frame is between three and six months, a value of three indicating a 7-12 month lag, a value of four meaning the lag is between one and two years, and a five signaling a very long lag of over two years. Before proceeding to a regression, we note that the correlation of the permit length variable with the fraction of housing stock priced more than 40 percent above the cost of new construction is fairly high at 0.43. The mean fraction of high cost housing among the cities with permit waiting times of at least six months is (i.e., a value of 3 or more for this variable) is 0.75. Difficult zoning seems to be ubiquitous in high cost areas.[15]

Table 6 reports some regression results using this variable. In the first column, we regress our housing cost measure (again using the share of the city's housing stock priced more than 40 percent above the cost of new construction) on the first zoning measure—time to get a permit issued for a rezoning request. We find a strong positive relationship, so that when the index increases by one, 15 percent more of the housing stock becomes quite expensive. This positive relationship also survives controlling for population growth during the 1980s and median income, as shown in the second column.[16]

In the final column of Table 6, we return to our implied zoning tax--T/L from above. This value is calculated using the data in Table 4. Specifically, we subtract the cost of land estimated in the non-linear hedonic equation (i.e., p from column 2 of Table 4) from the cost of land implied by subtracting structure cost from total home value (i.e., p+T/L from column 3 of Table 4). We then regress this variable on our zoning measure. As the results show, the implied zoning tax is strongly increasing in the length of time it takes to get a permit issued for a subdivision. Increasing a single category in terms of permit issuance lag is associated with a nearly $7 per square foot increase in the implicit zoning tax. If the dependent variable is logged, the results imply that a one unit increase in the index is associated with a 0.50 log point increase in the implicit zoning tax.[17]

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[14] We used the price series from the non-linear hedonic in the underlying regression. Only the regression involving the construction-based land prices (column 3 of Table 4) yields statistically significant results at conventional levels.

[15] Other measures in the data base include the analogue to this rezoning question, except that the permit length time applies to a completely new subdivision that does not require rezoning. We examined this and other variables and found correlation patterns similar to those presented below.

[16] Adding region dummies to the specification eliminates any significant positive correlation between this zoning control and the fraction of expensive housing in the area.

[17] Finally, similar results obtain if other approval time variables are used (e.g., that for a new subdivision).

VII. Conclusion

America is not facing a nationwide affordable housing crisis. In most of the country, home prices appear to be fairly close to the physical costs of construction. In some of the country, home prices are even far below the physical costs of construction. Only in particular areas, especially New York City and California, do housing prices diverge substantially from the costs of new construction.

In the areas where houses are expensive, the classic urban model fares relatively poorly. These areas are not generally characterized by substantially higher marginal costs of land as estimated by a hedonic model. The hedonic results imply that the cost of a house on 10,000 square feet is usually pretty close in value to a house on 15,000 square feet. In addition, these high prices often are not associated with extremely high densities. For example, there is as much land per household in San Diego (a high price area) as there is in Cleveland (a low price area).

The bulk of the evidence marshaled in this paper suggests that zoning, and other land use controls, are more responsible for high prices where we see them. There is a huge gap between the price of land implied by the gap between home prices and construction costs and the price of land implied by the price differences between homes on 10,000 square feet and homes on 15,000 square feet. Measures of zoning strictness are highly correlated with high prices. While all of our evidence is suggestive, not definitive, it seems to suggest that this form of government regulation is responsible for high housing costs where they exist.

We have not considered the benefits from zoning which could certainly outweigh these costs. However, if policy advocates are interested in reducing housing costs, they would do well to start with zoning reform. Building small numbers of subsidized on housing units is likely to have a trivial impact on average housing prices (given any reasonable demand elasticity), even if well targeted towards deserving poor households. However, reducing the implied zoning tax on new construction could well have a massive impact on housing prices.

Of course, it may well be that the positive impact of zoning on housing prices is zoning's strongest appeal. If we move to a regime with weaker zoning rules, then current homeowners in high cost areas are likely to lose substantially. To make this politically feasible, it is crucial that any political reform also try to compensate the losers for this change.

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Appendix 1: Construction of the House Value/Construction Cost Ratio

A number of adjustments are made to the underlying house price data in the comparison of prices to construction costs. These include imputation of the square footage of living area for observations from the *IPUMS* for the 1980 and 1990 census years. However, because the results reported in this paper do not include census data, we omit the description of that imputation. See our 2001 working paper for those details.

Two adjustments are made to the *AHS* house price data to account for the depreciation that occurs on older homes and to account for the fact that research shows owners tend to overestimate the value of their homes. The remainder of this Appendix provides the details.

One adjustment takes into account the fact that research shows owners tend to overestimate the value of their homes. Following the survey and recent estimation by Goodman & Ittner, 1992, we presume that owners typically overvalue their homes by 6 percent.[18]

Empirically, the most important adjustment takes into account the fact that the vast majority of our homes are not new and have experienced real depreciation. Depreciation factors are estimated using the *AHS.* More specifically, we regress house value per square foot (scaled down by the Goodman & Ittner, 1992, correction) in the relevant year on a series of age controls and metropolitan area dummies. The age data is in interval form so that we can tell if a house is from 0-5 years old, from 6-10 years old, from 11-25 years old, from 25-36 years old, and more than 45 years old. The coefficients on the age controls are each negative as expected and represent the extent to which houses of different ages have depreciated in value on a per square foot basis.

[18] This effect turns out to be relatively minor in terms of its quantitative impact on the results.

Finally, we should note that our procedure effectively assumes that units with a basement in the *AHS* have unfinished basements, so that we underestimate construction costs for units with finished basements. Having a basement adds materially to construction costs according to the Means data. Those units with unfinished basements have about 10 percent higher construction costs depending on the size of the unit. Units with finished basements have up to 30 percent higher construction costs, again depending on the size of the unit.

After these adjustments, house value is then compared to construction costs to produce the distributions reported in the main text.

Table 1: Distribution of Single Family House Prices Relative to Construction Costs, American Housing Survey Data-1989 and 1999, Central City Observations

	1989 AHS		1999 AHS	
	% Units Valued at <90% of CC	% Units Valued at >140% of CC	% Units Valued as <90% of CC	% Units Valued at >140% of CC
Nation	0.17	0.46	0.17	0.50
Midwest	0.41	0.14	0.30	0.27
Northeast	0.12	0.58	0.37	0.34
South	0.11	0.50	0.13	0.46
West	0.05	0.69	0.04	0.77

Source: Authors' calculations.

Table 2: House Price/Construction Cost Distribution, City Areas, 1989 and 1999

City	*% Units Valued at <90% of CC 1989*	*% Units Valued at >140% of CC 1989*	*%Units Valued at <90% of CC 1999*	*%Units Valued at >140% of CC 1999*
albuquerque city	0.02	0.82	0.03	0.83
anaheim city	0.00	1.00	0.00	0.93
austin city	0.00	0.46	0.06	0.71
baltimore city	0.18	0.41	0.30	0.27
chicago city	0.20	0.28	0.16	0.44
columbus city	0.33	0.18	0.12	0.29
dallas city	0.06	0.56	0.13	0.47
denver city	0.04	0.60	0.08	0.86
detroit city	0.85	0.05	0.54	0.20
el paso city	0.05	0.34	0.02	0.28
fort worth city	0.12	0.40	0.26	0.29
greensboro city	0.13	0.59	0.00	0.69
houston city	0.25	0.40	0.25	0.27
indianapolis city	0.25	0.22	0.24	0.22
jacksonville city	0.08	0.55	0.11	0.43
kansas city city	0.33	0.09	0.40	0.12
las vegas city	0.00	0.29	0.03	0.45
little rock city	0.09	0.36	0.08	0.40
los angeles city	0.02	0.93	0.04	0.89
milwaukee city	0.32	0.10	0.27	0.22
minneapolis city	0.22	0.21	0.20	0.30
nashville-davidson city	0.02	0.69	0.05	0.56
new orleans city	0.02	0.49	0.03	0.57
new york city	0.04	0.81	0.11	0.56
norfolk city	0.01	0.87	0.02	0.66
oklahoma city city	0.13	0.30	0.16	0.41
omaha city	0.21	0.15	0.30	0.21
philadelphia city	0.10	0.52	0.60	0.16
phoenix city	0.02	0.69	0.05	0.65
raleigh city	0.06	0.81	0.02	0.81
sacramento city	0.00	0.55	0.03	0.72
san antonio city	0.12	0.48	0.30	0.26
san diego city	0.07	0.88	0.03	0.93
san francisco city	0.00	0.97	0.04	0.96
seattle city	0.06	0.49	0.02	0.86
tampa city	0.09	0.43	0.13	0.49
toledo city	0.27	0.16	0.40	0.23
tucson city	0.06	0.43	0.04	0.61
tulsa city	0.07	0.36	0.08	0.38
wichita city	0.18	0.21	0.13	0.48

Table 3: House Price/Construction Cost Distribution, Suburban Areas, 1989 and 1999

City	*% Units Valued at <90% of CC 1989*	*%Units Valued at >140% of CC 1989*	*%Units Valued at <90% of CC 1999*	*%Units Valued at >140% of CC 1999*
albany city	0.06	0.63	0.00	0.40
anaheim city	0.02	0.96	0.03	0.96
atlanta city	0.03	0.67	0.06	0.58
baltimore city	0.05	0.66	0.01	0.61
birmingham city	0.10	0.56	0.12	0.53
boston city	0.01	0.87	0.02	0.86
chicago city	0.06	0.67	0.05	0.74
cincinnati city	0.10	0.29	0.10	0.47
cleveland city	0.15	0.23	0.05	0.58
columbus city	0.12	0.47	0.03	0.61
dallas city	0.03	0.58	0.06	0.52
detroit city	0.24	0.26	0.08	0.58
fort lauderdale city	0.00	0.76	0.00	0.85
fort worth city	0.09	0.59	0.09	0.49
houston city	0.23	0.24	0.08	0.31
kansas city city	0.15	0.22	0.05	0.33
los angeles city	0.04	0.91	0.04	0.89
miami city	0.05	0.72	0.00	0.73
milwaukee city	0.05	0.39	0.08	0.53
minneapolis city	0.08	0.29	0.05	0.43
new orleans city	0.10	0.53	0.06	0.61
new york city	0.03	0.85	0.09	0.78
newark city	0.01	0.96	0.01	0.72
orlando city	0.03	0.70	0.04	0.61
oxnard city	0.00	1.00	0.04	0.93
philadelphia city	0.03	0.78	0.11	0.47
phoenix city	0.02	0.65	0.00	0.76
pittsburgh city	0.23	0.19	0.25	0.21
riverside city	0.05	0.87	0.02	0.76
rochester city	0.01	0.63	0.09	0.28
sacramento city	0.03	0.83	0.05	0.72
salt lake city city	0.10	0.22	0.02	0.86
san diego city	0.04	0.92	0.05	0.88
san francisco city	0.01	0.98	0.02	0.97
seattle city	0.02	0.72	0.01	0.90
st. louis city	0.11	0.34	0.21	0.34
tampa city	0.03	0.57	0.05	0.66

Note: CC=Construction Costs

Table 4: Land Price on the Extensive and Intensive Margins

City	*Hedonic Price of Land/ft^2 Linear Specification*	*Hedonic Price of Land/ft^2 Log-Log Specification*	*Imputed Land Cost from Means Data (Entensive Margin)*	*Mean House Price*
Anaheim	\$2.89 (1.54)	\$3.55 (1.34)	\$38.99	\$312,312
Atlanta	\$0.23 (0.50)	-\$0.30 (-0.70)	\$3.20	\$150,027
Baltimore	\$1.15 (2.53)	\$5.21 (2.31)	\$4.43	\$152,813
Boston	\$0.07 (0.10)	\$0.55 (0.67)	\$13.16	\$250,897
Chicago	\$0.79 (2.43)	\$0.80 (1.96)	\$14.57	\$184,249
Cincinnati	\$0.89 (1.92)	\$0.50 (1.14)	\$2.71	\$114,083
Cleveland	\$0.26 (0.95)	\$0.24 (0.81)	\$4.13	\$128,127
Dallas	-\$0.83 (-1.14)	\$0.21 (0.27)	\$5.42	\$117,805
Detroit	\$0.14 (0.92)	\$0.45 (2.31)	\$5.10	\$138,217
Houston	\$1.43 (2.61)	\$1.62 (2.66)	\$4.37	\$108,463
Kansas City	\$2.06 (2.75)	\$1.65 (2.11)	\$1.92	\$112,700
Los Angeles	\$2.19 (4.63)	\$2.60 (3.53)	\$30.44	\$254,221
Miami	\$0.37 (0.45)	\$0.18 (0.24)	\$10.87	\$153,041
Milwaukee	\$1.44 (3.08)	\$0.95 (1.90)	\$3.04	\$130,451
Minneapolis	\$0.29 (0.93)	\$0.35 (1.09)	\$8.81	\$149,267
New York City	\$0.84 (1.09)	\$1.62 (1.60)	\$32.33	\$252,743
Newark	\$0.42 (0.62)	\$0.10 (0.11)	\$17.70	\$231,312
Philadelphia	\$1.07 (6.41)	\$0.77 (5.28)	\$3.20	\$163,615

City	*Hedonic Price of Land/ft² Linear Specification*	*Hedonic Price of Land/ft² Log-Log Specification*	*Imputed Land Cost from Means Data (Intensive Margin)*	*Mean House Price*
Phoenix	$1.89 (3.88)	$1.86 (3.26)	$6.86	$143,296
Pittsburgh	$2.28 (6.26)	$1.71 (4.55)	$3.08	$106,747
Riverside	$1.35 (3.55)	$1.60 (2.95)	$7.92	$149,819
San Diego	$0.58 (0.97)	$1.29 (1.33)	$26.12	$245,764
San Francisco	$0.97 (0.76)	$7.84 (2.42)	$63.72	$461,209
Seattle	-$0.68 (-0.69)	$0.48 (0.06)	$18.91	$262,676
St. Louis	$0.63 (1.91)	$0.07 (1.55)	$1.74	$110,335
Tampa	$0.19 (0.36)	$0.89 (1.30)	$6.32	$101,593

Table 5: Density and the Distribution of House Prices, Cities, 1990

	Dep. Var: Log Land Area per HH	*Dep. Var: Log Land Area per HH*	*Dep. Var: Log Land Area per HH*	*Dep. Var: % Units Valued at ≥ 140% of CC*	*Dep. Var: Log Land Area per HH*	*(2SLS: Mean Jan. Temp. as Instrument) Dep. Var: Log Land Area per HH*
% Units Valued at ≥ 140% of CC	-0.510 (0.451)	-0.576 (0.507)				1.177 (0.880)
Log Median Family Income, 1989		0.266 (0.895)				
Median House Price, 1990			-0.565 (0.225)			
Mean January Temperature				0.013 (0.003)	0.015 (0.009)	
Intercept	-7.050 (0.245)	-9.784 (9.191)	-0.959 (2.536)	-0.021 (0.113)	-7.882 (0.387)	-17.254 (8.678)
$\overline{R}^2$	0.01	-0.02	0.12	0.34	0.04	
Number of Obs.	40	40	40	40	40	40

Notes: Standard errors in parentheses
Density is defined as the log of the ratio of square miles of land in the city divided by the number of households. See the text for the details.

Table 6: Zoning Regulations and the Distribution of House Prices

	Dep. Variable: % Units Valued at ≥ 140 % of CC	*Dep. Variable: % Units Valued at ≥ 140 % of CC*	*Dep. Variable: T/L from Table 4 (Implied Zoning Tax)*
Time to Permit Issuance for Rezoning Request	0.150 (0.051)	0.112 (0.044)	6.796 (3.048)
Log Median Family Income, 1989		0.260 (0.255)	
% Pop. Growth, 1980-1990		1.080 (0.411)	
Intercept	0.111 (0.120)	-2.512 (2.634)	-3.527 (7.732)
$\overline{R}^2$	0.16	0.40	0.15
N	40	40	22

Notes: The independent zoning variable is a categorical measure of time lag between application for rezoning and issuance of building permit for development of a modest sized single family subdivision. See the text for details.

Figure 1: House Prices/Construction Costs Over Time, Cities

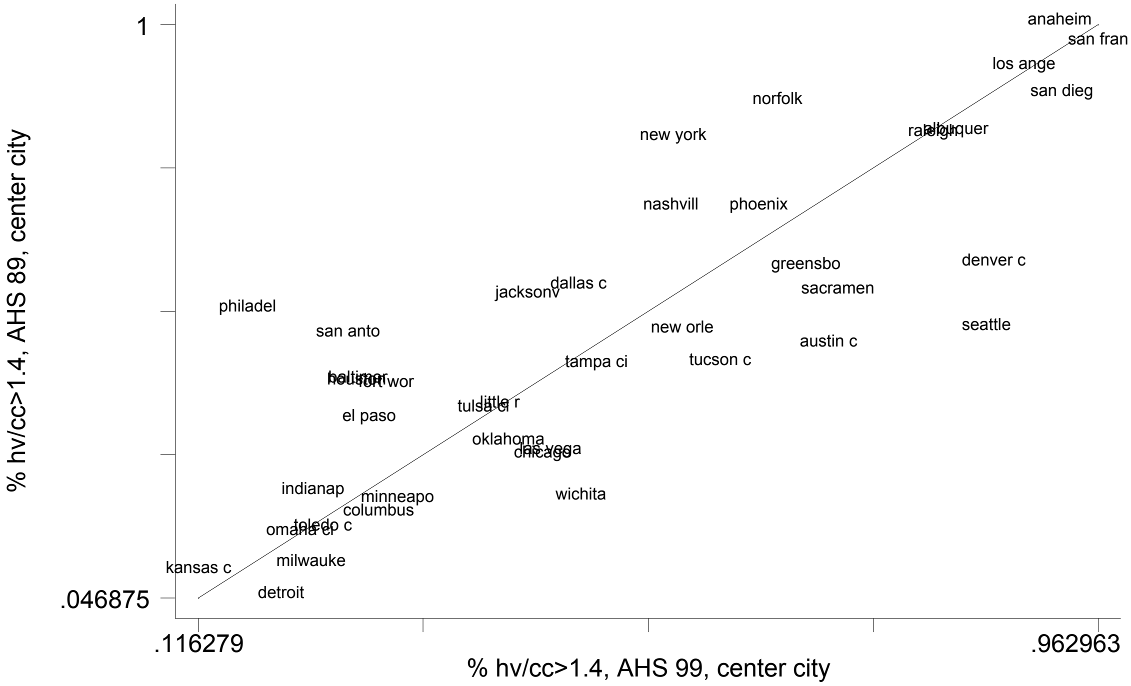

Figure 2: House Prices/Construction Costs Over Time, Suburbs

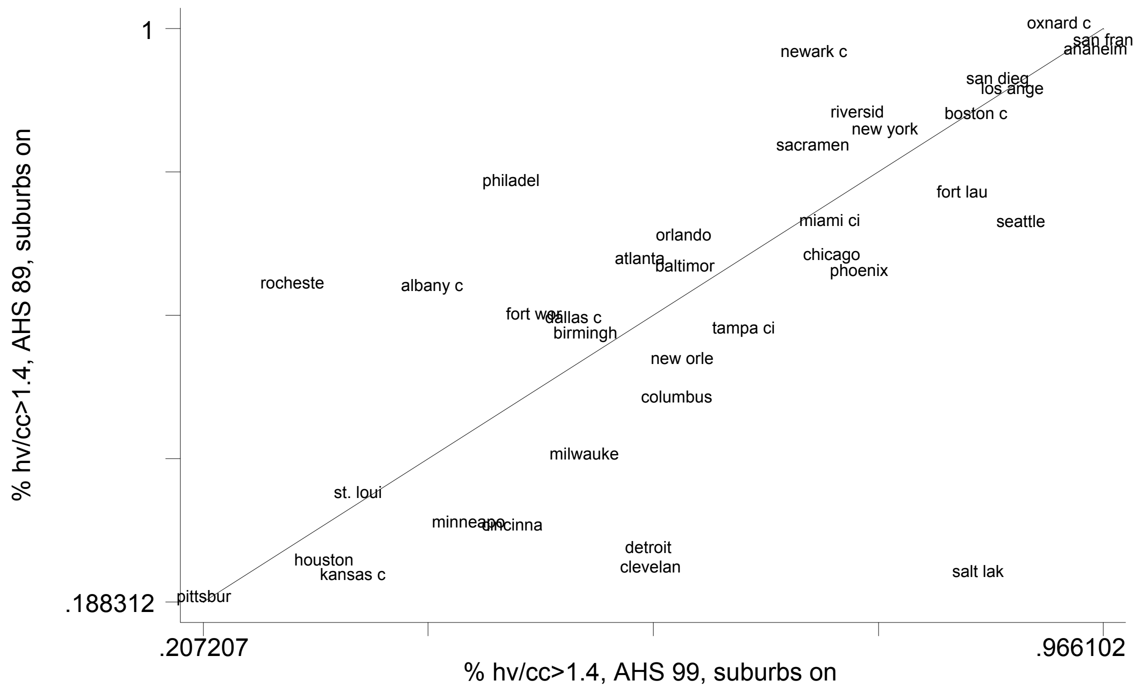

Figure 3: Density and the Distribution of House Prices,
Central Cities, 1990