Is There a Supply Side to Urban Revival?

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Abstract

There are economically large differences in construction costs across U.S. housing markets. This has important implications for urban revitalization because it is not low house prices *per se* that curb investment and redevelopment, but prices that are low relative to construction costs. Cost differences across markets are not due to an upwardly sloping supply for physical structure, as we estimate it to be highly elastic. Factors that explain differences in building costs include the extent of unionization within the construction sector, local wages, density, and public spending on regulatory enforcement. Costs are also systematically higher in the Northeast and West census regions. While real costs have declined by 11 percent on average over the past 15 years, their variance across markets has increased. Unionization in the construction sector and local wage growth are the most important predictors of recent cost inflation. In areas with large fractions of homes with prices close to replacement value, the evolution of construction costs in particular and supply side conditions more generally could be critical to their future viability as urbanized places.

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The decline of major urban centers in the Rust Belt and elsewhere is viewed largely as the consequence of negative shocks to the demand for those areas. There is no shortage of such shocks, including the deurbanization of manufacturing, the rise of an automobile culture which lessened the attractiveness of older cities with inefficient road networks, and the invention of new technologies such as air conditioning which made it feasible to live and work comfortably in hotter climates. Much of the modern growth literature that deals with urban issues also concentrates on the demand side of cities. Jacobs (1969), Glaeser, Kallal, Shleifer, and Sheinkman (1995), Black and Henderson (2000), Glaeser, Kolko, and Saiz (2001) and Glaeser and Saiz (2003) show how diversity, education (or skill), and consumption have become major drivers of contemporary urban growth in developed countries.

In this paper, we investigate whether there is an independent role for supply in the housing market. The supply side of urban decline or growth largely has been ignored until recently. The prediction from Tobin's q theory that capital investment in assets should change discretely around the point where price equals replacement cost helps us understand how supply conditions could be relevant. It suggests that it is not low housing prices *per se* that hamper investment and redevelopment, but prices that are low relative to construction costs. Gyourko and Saiz (2004) confirm that owners of homes valued below construction cost spend nearly 50 percent less on maintenance, repairs, or additions than do otherwise equivalent owners with homes priced above replacement costs.

In addition, Glaeser and Gyourko's (2001) findings suggest that the price of the median home in the typical metropolitan area is determined more by construction costs than by demand factors. We begin our analysis by extending their findings using data on costs and prices across metropolitan markets over the last quarter century. The elasticity of *existing* house price changes to changes in the construction costs of *new* structures is estimated to be 0.7 at the mean, implying that the share of land in the value of the existing housing stock is about 0.3 (30 percent).

While housing values are strongly positively correlated with constructions costs, they do not move one-for-one. Increases in construction costs are shown to raise the share of housing units with values below replacement cost, especially in areas with larger fractions of their housing stock priced close to construction costs. This raises the possibility that the supply side itself affects urban revival or decline. To better understand what role, if any, that supply conditions might be playing, we document the cross-sectional variation in housing construction costs both across market areas and within areas over time, and then identify the key determinants of this variation.

Data on construction costs for new homes in 177 metropolitan areas show a material and increasing dispersion since 1980—over a time when real average costs have been falling. Looking just at the 50 largest metropolitan areas finds a 70 percent difference between the most and least expensive markets. The stylized facts about the evolution of costs are also striking. Between 1986 and 2000, real construction costs fell by 11 percent on average, while their standard deviation grew by 4.3 percent.

We begin our analysis of these data by estimating the elasticity of supply of physical structure. As expected, the building itself (as distinct from the land) is in extremely elastic supply according to our estimates. Not only does this imply that rapid growth can be accommodated without the cost or price of the structure increasing[1], it indicates that areas experiencing negative demand shocks do not see physical production costs fall just because there is a lower level of building. Thus, the supply side does not provide an ‘automatic stabilizer’ when demand weakens.

While differences in the level of building activity do not explain much of the cross sectional variation in costs, a number of supply shifters do. They include regional fixed effects, union penetration in the area’s construction sector, density, wages in the metropolitan area, and local spending effort on inspections and other regulations. Of these factors, regional effects and construction sector unionization rates have the biggest impacts on local construction costs. Metropolitan areas in the Northeast and West census regions have 14 percent higher costs than those in the South. Costs are nearly 5 percent higher if the unionization rate in the local construction sector is 33 percent versus 11 percent - the interquartile range for that variable in the typical cross section. It is noteworthy that this effect holds controlling for unionization in the durable goods sector. Thus, it is not the case that highly unionized areas in general have higher building costs, only those with a strong union presence in the construction sector.

Our analysis of the evolution of costs between 1986 and 2000 within areas finds a very strong impact for the initial level of construction sector unionization. Having a 35 percent unionization rate in the construction sector versus a 9 percent rate (which represents the interquartile range in 1986) is associated with a 5.3 percentage point higher growth in real costs between 1986 and 2000. This is nearly half of the mean (absolute)

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[1] That structure can be supplied at almost constant cost suggests that the high house prices we see in some high demand areas (e.g., San Diego, Los Angeles, Seattle) are not due to a technological constraint associated with home building. Land availability and development restrictions underlie that phenomenon. While important for both economic and social reasons, it is a separate research topic.

change in costs of -11 percent over this fifteen year span. Other variables, including the growth in construction sector unionization, average wage growth in the metropolitan area, and region controls also are statistically significant, albeit less economically important, predictors of cost changes. Even though the West presently is a high construction cost region, the time series analysis shows that only the Northeast region has become relatively more costly over time. If these trends continue, the dispersion in costs across local markets will increase, with highly unionized, Northeastern markets becoming relatively (and sometimes, absolutely) more costly places in which to build.

To learn more about the areas in which changes in construction costs are likely to impact decline or renovation, we compute the distribution of house value-to-replacement-cost ratios from the special metropolitan areas files of the *American Housing Survey* from 1998-2002. While some areas (e.g., Boston, San Diego, San Francisco) have almost no homes valued below construction costs, most do and they can be categorized in one of two ways. One group of these areas (e.g., Chicago, Columbus (OH), Dallas) has the bulk of the mass of its price-to-construction cost (P/CC) ratio centered somewhat above one, but there still is a meaningfully large fraction of homes priced below cost. The second group of areas (e.g., Buffalo, Detroit, Philadelphia) also has a strongly single-peaked P/CC distribution, but it is peaked at a level below one.

We are most interested in areas with both high construction costs and large fractions of homes valued below construction costs. There are high production costs areas such as San Francisco that have almost no homes priced below physical replacement costs. In fact, 97 percent of San Francisco’s homes are valued at more than 1.3 times construction cost. Lowering those costs will not materially affect the incentives to reinvest or redevelop virtually any of San Francisco's housing stock even though its construction costs are the second highest in the nation.

Philadelphia presents a very different picture, with one-fifth of the owner-occupied homes in the metropolitan area being valued between 70 and 100 percent of physical replacement costs. Philadelphia has the sixth highest construction costs in the nation, being 20 percent above the median for the top fifty markets. Simulations of the impact of construction cost reductions for this market suggest that 15 percent of all its housing priced below construction cost would be valued above construction costs if it could become an average cost market. The share increases to 25 percent if Philadelphia could lower costs to those for the 25th percentile market in terms of building costs. Stated differently, this latter result implies that 11 percent of the overall metropolitan area housing stock would change from being valued below cost to above cost if Philadelphia's building costs could be lowered to those found in Miami, FL.

Given recent research on how reinvestment in the housing stock is so strongly affected by whether price is above replacement cost, it is easy to see why individual owners and local officials should care about supply side conditions in their markets. Not only are there economically meaningful differences in costs across markets but the fact that they are not driven by national technological constraints beckons both researchers and policymakers to devote more attention to the supply side of city revitalization. In particular, mayors probably should be as concerned about minimizing costs as any private company CEO. This complements the demand-side policies suggested by the urban growth literature cited above. However, we hasten to add that this is not a justification for subsidizing investment in high construction cost areas. After all, there generally is no efficiency gain from subsidizing a high cost firm that is failing in a competitive market. Society is better off if the assets are redeployed to more productive firms. As long as the market for firm and household location is competitive, and it certainly appears to be, we should have the same perspective on the decline of places such as Detroit or Philadelphia.[2]

The remainder of the paper is organized as follows. Section 2 describes the data sources and our manipulation of them. This is followed in Section 3's documentation pf the generally strong link between housing prices and constructions costs. Section 4 reports our findings on the determinants of differences in the level of construction costs across markets and the drivers of cost changes over time. Section 5 then identifies the markets most likely to be affected by supply side interventions that reduced construction costs. Section 6 concludes the paper.

2. Data

The national files of the *American Housing Survey* (*AHS*) are used to document the long-run evolution of house prices. Micro-data are gathered from 1974 to 2001, with the series being annual from 1974-1981 and biannual after that. The *AHS* national samples are used to construct a panel of average house values by area and year for Metropolitan Statistical Areas (MSAs) with at least 30 valid observations.

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[2] That said, there well may be higher transition costs and certain negative externalities associated with redeploying people and capital in an urban context. Cities have large, valuable, and immobile asset bases such as durable housing stocks. While the cost of installing that stock in Philadelphia is sunk, real economic costs are incurred by depreciating it faster than is optimal and by having to build new stock in other places as Philadelphia's decline is accelerated by its disadvantageous supply side conditions. In addition, if the units valued below cost are spatially concentrated, there could be important negative externalities at the neighborhood level. That clearly is a potentially important avenue for future research.

The R.S. Means Company is the source for construction costs. This data provider and consulting firm to the construction industry monitors the cost of putting up the physical structure in numerous American and Canadian cities. Local construction costs per square foot of living area are reported. These reflect material costs, labor costs, and equipment costs for four different qualities of single unit residences. No land costs are included.[3] The Means Company also reports costs for four qualities of homes—economy, average, custom, and luxury. The data are further broken down by the size of living area (ranging from 600ft^2 to 3,200ft^2), the number of stories in the unit, and a few other characteristics such as the presence of a basement.[4]

The *AHS* and Means data are combined to create the ratio of house price-to-construction cost (P/CC). House prices are successfully matched to construction cost data for 108 metropolitan areas across the country. We focus on costs for a basic, economy-quality house with the average cost associated with four possible types of siding and building frame. Generally, our choices reflect low to modest construction costs. We also used unit traits from the *AHS* to impute the relevant costs for each unit (e.g., whether there was a basement). In order to obtain comparable values for homes 'as if new', a number of adjustments are made to the *AHS* data prior to constructing the P/CC

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[3] 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.

[4] Somerville (1999) points out that the evolution of a particular hedonic estimate of construction costs for a sample of new homes in Baltimore, Cincinnati and Houston from 1979 to 1991 follows a different evolution than do the R.S. Means Company indexes for those markets. While we do not argue that the data are perfect, the Means data have passed the market test of revealed preference in that it is very widely used in the construction sector for budgeting purposes—an important indicator of reliability, we believe. In addition, these data perform very well as an explanatory variable in our specifications reported below, and the data work as expected in Glaeser and Gyourko's (2001) study of urban decline. In addition, any white noise measurement error should have its usual effect of biasing the correlations of interest in our paper towards zero. That said, to dispel any concerns regarding non-classical measurement error that could be correlated with the right-hand-side variables used in our analysis, we also gathered data on wages in the

ratio. While the data appendix goes into the details, it is noteworthy that prices are adjusted to account for depreciation, vintage, general inflation, and the fact that research shows owners overestimate the value of their homes.[5]

We also matched the construction cost data to the samples in the special metropolitan housing surveys (1998-2002) of the *American Housing Survey*. The metro *AHS* increases the sample size within the metro areas sampled, but this particular data source is limited to a relatively few metro areas each year (from 4 to11). These data are used to compute the kernel density estimates of the distribution of the value-to-cost ratios that are reported in Section 5.

A host of other variables were collected for use in our estimations. Data on housing permits are taken from the U. S. Bureau of the Census *Series C-40* reports; per capita MSA-level income and employment are from the *Bureau of Economic Analysis* (*BEA*); average wages and the Consumer Price Index (CPI) deflator are from the Bureau of Labor Statistics (BLS); and data on expenditures in inspection and regulation by local governments at the MSA level come from several issues of the *Census of Governments*. We also measure the density of the metropolitan area as the number of people per square mile. When matching these data to specific areas, 1999 MSA and NECMSA definitions are used.

Our last set of variables captures union strength across metropolitan areas. The extent of unionization in the construction sector and among durable goods producers is measured with data from the *Current Population Survey* (CPS) monthly outgoing rotation

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construction sector as a proxy for costs and obtained consistent results. Those results are reported in Appendix Table 2.

groups' files. Unionization rates are calculated by pooling all observations in a year by metro area. Given the importance of construction sector unionization in the analysis below, we report union penetration rates in Appendix Table 1 for the fifty metropolitan areas with populations of at least one million in 1992. There is a very wide range of union penetration in the construction sector, ranging from less than 2 percent in the North Carolina markets (Charlotte and Greesnboro) to 50 percent in the older manufacturing centers (St. Louis and Chicago). In 12 of these areas, unionization rates are below 10 percent; in another 15, they exceed 30 percent. The same data source allows us to calculate average wages in the construction sector by MSA and year.

3. House Prices and Construction Costs: Do They Move in Tandem Everywhere?

There are extensive literatures in urban and real estate economics focused on Ricardian rents (e.g., the classic monocentric city framework developed by Alonso (1964), Mills (1967), and Muth (1969)), the capitalization of local amenities and public goods on home values (Roback, 1980; Gyourko and Tracy 1991) and the asset pricing of residential real estate (Poterba, 1984). However, relatively little has been written on the relationship between physical construction costs and house prices. Glaeser and Gyourko (2001), using data from the 1980 and 1990 censuses, conclude that house price is pinned down by construction costs throughout much of the United States. Given the potentially critical importance of that finding for this paper, we extend their work using 28 years of

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[5] Prices are deflated by 6 percent to account for self-reported overvaluations by owners. [See Goodman and Ittner (1992).] Despite this, the mean adjusted value is 32 percent bigger than the unadjusted mean, due to the importance of age and vintage effects.

house price data across many metropolitan areas from the 1974-2001 national *AHS* in conjunction with physical construction costs from the R.S. Means Company.

The P/CC ratio for all owner-occupied, single or attached unit, homes in each metropolitan area in the national *AHS* is constructed as described above in the data section. Figures 1-4 plot this ratio for the 25th, 50th, and 75th percentiles of the house value distribution for each of the four main census regions. The P/CC ratio has hovered around one for the 25th percentile home in all regions but the West. And, the median home often is valued between 20-50 percent above physical construction costs outside the West region—at least, until very recent times when prices have risen. Given that we are using construction costs associated with a modest quality unit in the denominator, these results suggest that land long has been relatively inexpensive for the median priced home in most parts of the country. In the East, Midwest and South regions of the country, construction costs do seem to be the most important component of value for the vast majority of dwellings.

This is confirmed by the regression results reported in the first two columns of Table 1. The dependent variable in these specifications is the log of average house value by metropolitan area and year. In equilibrium, house values should equal physical construction costs plus land value. Hence, we estimate the following reduced-form equation

$$(1)\ \ln V_{kt} = \pi \ln C_{kt} + Z_{kt}\Theta + \Omega_t + \partial_k + \xi_{kt},$$

where V_{kt} stands for average home value, C_{kt} is the construction cost per square foot of an economy-quality home, Z_{kt} is a vector of other covariates, Ω_t is a year fixed effect,

∂_k is a metropolitan area random effect, and ξ_{kt} is an AR(1) perturbation.[6] By sweeping out annual fixed effects, changes in construction costs are related to changes in house values using variation within cities.

The elasticity of average house values with respect to construction costs is very close to 0.7, even when we control for income, employment and income inequality (as measured by the standard deviation of income within a MSA—see column 2 of Table 1). Thus, around the sample mean, a one percent increase in construction costs is associated with 0.7 percent higher house prices. The coefficients suggest a 30 percent land share, which is quite consistent with the implications of Figures 1-4.[7]

Although average house values grow with construction costs, the number of units with values below construction cost is also bound to grow. To see this more clearly, assume that the log of house prices (*P*) is an increasing function on the quality of the location and the log of construction cost (*C*) so that $P = P(Q, C)$.[8] The distribution function of location qualities is $F(Q)$. The share of houses with values below construction costs (denoted SB) is $SB = \int_0^{Q*} dF(Q) \cdot dQ$, where $Q*$ is such that $C = P(Q*, C)$. By Leibnitz rule and the total differentiation of the equation that defines Q*, we obtain

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[6] There is an extensive literature on serial correlation of house prices, even at annual frequencies. See Case and Shiller (1989) for one of the first and best analyses.

[7] Rosenthal (1999) reports results from a specification with structure value as the dependent variable. His finding that the elasticity of structure value with respect to construction cost is one for a sample of Vancouver, British Columbia, residences is consistent with the result in column 2 of Table 1. His result implies that changes in housing values that are orthogonal to changes in construction costs are attributable to the land component in our regressions

[8] All homes are assumed to physically identical and only differ in their location in this analysis.

$$(2)\ \frac{dSB}{dC}=\frac{dQ*}{dC}\cdot dF\left(Q*\right)=\left(1-\frac{\partial P(Q*,C)}{\partial C}\right)\cdot\left(\frac{dF\left(Q*\right)}{\partial P\left(Q*,C\right))\big/\partial Q}\right).$$

This expression is positive if the first term (one minus the local elasticity of prices to construction costs) is positive. This is likely since the *average* elasticity is below one: $E\left\{\frac{dP}{dC}\right\}=\int_0^\infty\frac{\partial P\left(Q,C\right)}{\partial C}\cdot dF\left(Q\right)\cdot dQ=0.7$, where E{ }denotes the expectation operator. However, the marginal impact of changes in construction costs on housing values could be different at different points in the quality distribution. The second multiplicative term in equation (2) corresponds to the number of units with prices just below construction costs before any change in costs.

It is not feasible to separately estimate the local elasticity of prices to construction costs and the distribution of unit qualities around $Q*$ (the number of units with values close to construction costs) for all metropolitan areas and years in our sample.[9] We can, however, provide an estimate of the average overall impact of rising costs on the share of units with values below construction costs. This is done by regressing the area's share of homes valued below construction cost on the same regressors. These results are reported in the next two columns of Table 1. Controlling for income, income variability, and employment, the results in column four imply that increasing production costs by one percent is associated with just over a 0.3 percentage point increase in the fraction of units valued below construction costs. The final two columns of Table 1 repeat this exercise on a smaller sample of metropolitan areas constituting the top third of markets with the

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[9] We observe the price distribution, not the implicit quality distribution. Individual prices are measured with error, so misclassification of units with prices around C is likely. Moreover, the number of

biggest fractions of home priced below construction costs between 1974-2000. In these 35 areas, which have relatively high proportions of their housing stocks priced close to replacement cost, a one percentage point increase in construction costs is associated with a 1.2 percentage point higher share of units with P/CC<1 (column 6, Table 1). Thus, in markets that have not been thriving, construction costs are associated with more substantial increases in the number of homes that are no longer attractive for reinvestment and development.

While Gyourko and Saiz (2004) have shown how reinvestment in existing homes is sharply reduced in units with values below replacement cost, Figures 5 and 6 highlight the importance of house prices being low relative to replacement costs for the growth of new housing development. If prices rise above construction costs, developers have an incentive to build, with the difference between price and replacement cost being capitalized into higher land values. Thus, a wider gap between house value and replacement cost does not necessarily imply a greater incentive to develop on the margin because land costs are higher. This is made explicit in the top panel of Figure 5 which plots the log of housing permits per capita against the log of average house value. As the flat fitted regression line suggests, the correlation between average house value and new development is zero if prices are above construction costs. Figure 6 then plots permitting activity per capita against the share of units below construction costs. Here, we see a dramatic negative correlation between new development and the share of housing units below replacement cost.[10]

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observations on units with values close to construction costs can be very small for a number of metropolitan areas and years (putting aside the issue of how one defines being close to the P/CC margin).

[10] This confirms and updates the finding in Glaeser and Gyourko (2001) that places with larger fractions of their housing stocks priced below construction costs do not grow much.

4. The Supply of Housing Structure and the Determinants of Construction Costs

Given the potential importance of the level of construction costs in determining the threshold between revitalization and decline, this section examines the nature and determinants of construction costs across metropolitan areas and their evolution over time. Table 2 reports real construction costs in 2001 dollars of a modest quality home in 1999 for the fifty largest metropolitan areas. Costs vary by over 70 percent across markets, ranging from just above $\$40/ft^2$ in the North Carolina markets of Raleigh and Greensboro to well over $\$65/ft^2$ in New York City and San Francisco. Across the interquartile range, there is a 20 percent difference in costs. And, there are a number of low growth or declining markets that are relatively expensive places to build. Philadelphia stands out in this regard, as it has the sixth highest construction costs among the fifty largest markets; Detroit ranks 14th; St. Louis is 16th; Pittsburgh is 17th; Cleveland is 18th; Milwaukee is 19th; and Rochester (NY) is 20th.

Accounting for Differences in Construction Costs across Metropolitan Areas

Our formal analysis of the cost side begins with an examination of the cross sectional variation in construction costs across markets. One contribution is an explicit estimate of the elasticity of supply of physical structure. The typical assumption in the literature on housing supply (i.e., for the combination of structure and land) is that structure is in perfectly elastic supply, but there are no published estimates of which we are aware.[11] Pinning down this parameter is important for our purposes because if the

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[11] See Mayer and Somerville (2000) for the state-of-the art approach to estimating housing supply, as well as references to the literature on housing supply--where the house includes the building and land.

supply of structures is even modestly inelastic so that construction costs fall in areas with declining demand, then maintaining existing structures or building new ones need not be financially unattractive. However, if supply really is highly elastic, then there is no 'automatic stabilizer' from falling costs in declining markets.[12]

Pooled ordinary least squares (OLS) estimates on 15 years of data from 1986-2000, with standard errors clustered at the metropolitan area level from a specification with the log of construction costs for a 2,000ft^2 economy-quality home as the dependent variable are reported in the first four columns of Table 3. The independent variables always include the demand for new structures in the area as reflected in the log of total housing permits. In some specifications, we include the log average wage in the MSA,[13] the log of population density, the share of construction workers that are unionized in the MSA,[14] the share of unionized workers in other durable goods industries, local government expenditures on regulation and inspection, and region dummies.

The coefficients on the log of permits indicate that construction costs are not sensitive to the number of housing units built, suggesting that the supply of structures is quite elastic. In fact, we cannot reject the null that all the coefficients on the log of

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[12] The focus on structure also is appropriate because of our interest in declining areas where land value is likely to be close to zero. In addition, since our estimation relies on the technological primitives that are standard in the theory of the firm, the supply function for physical structure is straightforward to interpret. Finally, our estimate does not rely on a time series on the national market to identify the supply elasticity. Because new development may be attracted by areas with relatively high local elasticities of supply, it is not immediately clear how one should interpret a national elasticity coefficient.

[13] Metropolitan area-wide wages are a good control for the opportunity cost of construction workers' time and, since the construction sector is relatively small, are reasonably exogenous to development levels. As Olsen (1987) points out, one should not control for construction sector wages themselves or for other input costs to the construction sector. By Sheppard's lemma, costs can be approximated locally by a linear function of input prices. Thus, controlling for input prices should trivially explain most of the variation in costs. Wages in other sectors act as a supply shifter that affects inputs prices, but are not affected by changes in construction levels.

[14] Some MSAs only have a few usable CPS observations in the construction sector. Naturally, unionization rates are estimated with more noise the smaller the number of complete observations. To address this issue,

housing permits in the first four columns of Table 3 are zero. However, the OLS specification suffers from a classic identification problem—namely, in areas with higher construction costs the demand for new building is likely to be lower.

If we let C be the cost of developing a standard housing structure and Q represent the number of housing permits (both in logs), the demand and supply system for new structures is given by equation (3),

$$\text{(3)}\quad \begin{aligned} &\text{Demand: } Q = C_D\alpha_1 + X\alpha_2 + Z\alpha_3 + \varepsilon \\ &\text{Supply: } C_S = Q\beta_1 + X\beta_2 + Y\beta_3 + \xi \equiv M\mathrm{B} + \xi\ . \end{aligned}$$

We are not concerned with the demand equation in this paper, so we use the exogenous variables that are excluded from the supply equation (the Z's) to identify all the parameters in the supply equation (which has one endogenous variable, Q). It is straightforward to show that the instrumental variables (IV) estimate of B is $(Z'M)^{-1}Z'P_S = B + (Z'M)^{-1}Z'\xi$ with a *plim*=B.[15]

Our IV estimation uses the log of population in 1940 and the share of metropolitan employment in the manufacturing industry in 1940 as instruments for the demand for new housing.[16] We report these results in column 5 of Table 3. As expected, the IV estimate of the supply elasticity is substantially larger, but it still suggests a very

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we weight the observations by the number of valid CPS responses. Results for the other variables are not sensitive to this weighting.

[15] Since there is one endogenous variable and two exclusion restrictions, consistent estimates of all the parameters in the supply equation are provided by 2SLS.

[16] Population is a natural instrument because depreciation and turnover is higher in bigger markets, generating a stronger demand for new units. Construction activity is, in fact, higher in bigger metropolitan areas. Population in 1940 is used to avoid the endogeneity of contemporaneous population changes to construction costs and housing prices. The share of employment in manufacturing has been shown to be a very strong predictor of urban growth (Glaeser and Saiz, 2003). Statistically, both instruments are positively related to permits in the first stage, and they are powerful (e.g., the F-test-statistic for the excluded instruments in the first stage is 130).

elastic supply of physical structures.[17] The estimated coefficient of 0.026 implies a supply elasticity of about 38 (1/0.026~38). For a ten percent increase in the number of permits (which equals 620 permits about the mean across all metropolitan areas in our sample), construction costs would be higher by only 13.3 cents per square foot for the average economy-quality home that cost \$51.08/ft^2 to build (i.e., \$0.133/\$51.08=.0026). Not only can rapidly growing areas supply more physical structure at almost constant cost,[18] but physical production costs in declining areas do not fall much just because the demand for new buildings is low. Thus, the cost side does not provide an 'automatic stabilizer' that helps buffer the impact of negative demand shocks.

Nevertheless, the huge variation in permitting activity associated with differences in the scale of metropolitan areas implies that even a supply elasticity of 38 is associated with somewhat higher costs in large markets. For example, the 25th percentile metropolitan area is terms of permitting activity issues 1,207 annually; the 75th percentile area issues 7,987 permits annually. The effect associated with increasing the permitting level across this interquartile range is 2.8 percent higher costs, or about \$1.45/ft^2 based on the cost of construction for our modest quality reference unit.[19]

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[17] We also estimated specifications to test for nonlinearities in the relationship between prices and quantities. Models that included polynomials of construction costs or a series of 10 dummies for housing permit deciles were rejected in favor of the log linear relationship.

[18] Because our focus is on the cross-sectional variation in construction costs, these results do not imply that national increases in construction activity would not result in higher average input prices nationally, as they well may (Somerville, 1999). The proper conclusion is that relative changes in construction activity across areas do not change relative construction costs across the same areas--given the national level of construction.

[19] When interpreting this impact, one should be clear about the nature of the comparison that underlies it—namely, that it involves contrasting a large with a small market. The mean population of metro areas issuing fewer than 1,207 permits is only 212,593. The mean size of those issuing between 1,207 and 2,991 (the sample mean) permits is 423,011. Even if one looks at the third quartile in terms of permits (which run to 7,987, of course), the average population is 890,132. The top quartile of areas issuing more than 7,987 permits averages 2,587,752 people. Thus, quantities do not have an important influence on costs when one looks at reasonable changes in permitting activity within a metropolitan area. It is only when comparing small markets to large markets that quantities can be said to matter.

The supply shifters play more important roles in accounting for differences in construction costs across areas. The region dummies themselves explain half of the cross sectional variation. The Northeast and West census regions are relatively expensive, since the same quality house can be built for about 9 percent less in the Midwest (the omitted region). The South is the cheapest region in terms of construction costs, being over 5 percent less expensive than the Midwest. These results imply that there is over a $7 per square foot difference in what it takes to build our reference house in the high cost versus low cost regions of the country. The strong regional effects could reflect a variety of forces. For example, political or social factors (e.g., severity of growth restrictions or building codes) that influence costs may differ along regional lines. Whatever the cause, future research should try to identify the specific factors responsible for this large gap.

Higher average wages per worker in the labor market area are positively associated with higher construction costs. Recall that this variable reflects the impact of the opportunity cost of labor for construction workers, not a demand income effect (see footnote 15). The elasticity of construction costs with respect to average wages in the MSA is 0.18 (row 2, column 5). Increasing wages across their interquartile range (i.e., from $27,874 to $31,576) is associated with 2.1 percent higher construction costs, or about $1.09/ft^2.

The log of the MSA density is meant to capture the impact of congestion on construction costs. We would expect that it would be more expensive to build in denser areas. The regression results support that hypothesis, but the impact is small economically. A one percent higher density is associated with only 0.014 percent higher construction costs (row 3 of column 5). Even looking at a change across the interquartile range for this variable (from 68 to 188 people per square mile) finds that costs are only 0.84 percent higher—about 43 cents per square foot based on our hypothetical modest quality home.[20]

The share of construction workers that are unionized is a very strong predictor of higher construction costs. Given the highly significant coefficient of 0.21 (row 4 of the IV specification in column 5), an increase in union penetration across the interquartile range of this variable (which is from 11 to 33 percent) is associated with construction costs that are 4.6 percent higher, or about \$2.36/ft^2 about the sample mean for construction costs.[21] Union wage premia or the costs of restrictive work rules certainly could be directly related to higher construction costs.[22] However, the impact of unions on local economies is likely to be complex, and the extent of unionization may be associated with other factors such as stricter building codes or other omitted political and social factors that themselves influence building costs.[23]

While the region dummies certainly help control for the possibility that highly unionized areas may tend to be more expensive in general,[24] we also include the

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[20] If density is dropped, the only coefficient affected is that on the South region. In that case, the South is no longer significantly cheaper than the Midwest region (the omitted category for that variable set).

[21] We also experimented with models including non-linear effects of unions, which we could reject in favor of the linear specification.

[22] For example, Freeman and Medoff (1981) demonstrate that a one-percentage point increase in the unionization rate in the construction sector is associated with a 0.3 percent increase in union wages. Unions also have effects on productivity and the organization of labor within firms (Freeman and Medoff, 1983).

[23] For example, Burby et al. (2000) report a negative correlation between how strictly building codes are enforced and the level of new construction in a city. In addition, unions may be thriving in environments conducive to high costs. For instance, the September 9, 2002, *Philadelphia Inquirer* contained an article entitled “Board no longer granting variances from PVC pipe.” The article claimed that Philadelphia’s mayor, in response to appeals from the local plumbers’ union, had pressured building officials to stop issuing variances for PVC pipe (a plastic sewer pipe that is substantially cheaper and easier to install than the standard cast iron pipe). The plumbers’ union believed that allowing the cheaper and more flexible sewer pipe would hurt their members economically—largely because less time would be required on such jobs.

[24] Construction sector unionization rates vary systematically by region. If the region dummies are dropped from the IV specification, the coefficient on construction sector unionization more than doubles to 0.43.

unionization rate in the durable goods manufacturing sector and expenditures on inspections and regulations as regressors. If omitted variables at the metropolitan area level drive the relationship between unionization and construction costs, then the unionization rate in the durables sector should help capture this effect. However, the point estimate on the durables sector unionization rate is relatively small (at 0.042) and is not statistically different from zero. Thus, it is not highly unionized areas *per se* that are more expensive, but areas where unionization in the construction sector is high.[25]

Local public expenditures per capita on inspection and regulation are used to proxy for the strictness with which local regulations are enforced. Such areas should tend to be high cost areas. The positive coefficient on this variable is consistent with this view, and it is statistically significant at the 10 percent level. However, its magnitude (0.013) is relatively small in economic terms. The impact of raising expenditures along the interquartile range of this variable (from \$4.83 per person to \$11.55 per person) is associated with 0.9 percent higher costs, or about 43 cents per square foot about our mean structure cost.

Accounting for Construction Cost Appreciation within Metropolitan Areas

An intriguing stylized fact about the data is the increasing dispersion of construction costs in recent decades. Real mean construction costs in our 177 metropolitan area sample were \$57.59/ft^2 in 1980. The standard deviation about that mean was \$5.22/ft^2. Ten years later in 1990, real mean costs had fallen over three dollars

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Not controlling for unionization in the durables sector and expenditures in inspections results in an increase of only 20 percent to 0.24 for the construction sector union coefficient.

[25] In unreported regressions, we use unionization in the public sector to instrument for unionization in the construction sector. The concern there is that construction unions may thrive in areas with high existing

per square foot to \$54.26, while the standard deviation across the same metropolitan areas had risen to \$6.08/ft^2. This trend continued in the 1990s, as the R.S. Means data show average costs had fallen to \$51.48 per square foot in 2000, with the standard deviation increasing to \$6.27.

To better understand what accounts for the growth in construction cost 'inequality' across metropolitan areas, we turn to an analysis of long differences in construction costs to identify the factors driving the evolution of costs within a market.[26] Since we are not certain about the stability of the coefficients on the right hand side variables (i.e., it could be that the importance of some explanatory variables is increasing or decreasing over time), we model for the log of costs at time *t* as $C_t^S = M_t \beta_t + \varepsilon_t$, where the notation is as in equation (2) with the addition of a time subscript. Thus, the change in the log of costs between period t and period t+N is given by $\Delta C_{t+N}^S = \Delta M_{t+N} \beta_{t+N} + M_t \Delta \beta_{t+N} + \Delta \varepsilon_{t+N}$.[27]

Results from our regression of the percentage change in real construction costs between 1986 and 2000 on changes in the explanatory variables of the cross sectional model and their initial values are reported in Table 4. Real construction costs dropped significantly over this time, by about 11 percent. The interquartile range runs from -8 percent to -15 percent, with only a handful of metropolitan areas not experiencing a drop in real costs between 1986 and 2000. Given that changes in costs even over 15 years are

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rents in the construction sector. The results imply a much larger impact of unionization (the coefficient increases to 0.95), but it is less precisely estimated (the standard error is 0.28).

[26] The annual data are far too noisy to deploy a panel fixed effects (or random effects) model. The regressions in levels reported in Table 3 are credible because the R.S. Means Company can easily identify high versus low cost areas. However, annual *changes* in costs and, specially, annual changes in unionization rates are mostly noise and weighting by the number of observations in the metro area does not get around this problem. Essentially, the signal-to-noise ratio is very low when looking at costs across any two consecutive years. This is why we difference over the longest period available given the data.

likely to be measured with noise, the model fits the data remarkably well, with the R^2=0.70.

Both initial period conditions and changes over time affect the path of cost growth. The construction sector unionization rate in 1986 is a very strong predictor of subsequent construction cost inflation. The results from Table 4 suggest that changing the initial level of union penetration across the interquartile range (increasing from 9 percent to 35 percent in 1986) is associated with a 5.3 percentage point higher rate of cost appreciation between 1986 and 2000. Just how stark this effect is can be seen in Figure 7 which plots the log change in real construction costs over 1986-2000 against construction sector unionization in 1986. This bivariate regression accounts for 40 percent of the variation in the ensuing cost growth. Note that there is no metropolitan area in which costs rose between 1986-2000 that did not start out with relatively high union penetration in the construction sector. And, there is only one metropolitan area (Atlanta) whose costs did not fall by at least 5 percent in real terms that was not heavily unionized in 1986.

The only other initial period variable that is close to being statistically or economically significant is the initial level of housing permits. The coefficient of 0.009, which is significant only at the 10 percent level, implies a 0.9 percentage point higher rate of cost growth for a change across the interquartile range of permitting activity in 1986. This reflects a difference of 8,462 permits for that year, and recall that his experiment essentially compares a small versus a large metropolitan area. Thus, the result indicates that larger metropolitan areas in 1986 experienced modestly smaller real cost declines between 1986 and 2000 (*cet. par*.)

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[27] We comfortably reject the hypothesis $\Delta\beta_{t+1} = 0$.

Metropolitan areas in the Northeast census region saw costs grow by 4.2 percentage points more than those in the South and Midwest between 1986 and 2000. However, construction costs in western metros fell by about 2.4 points relative to those in the South and Midwest over the same time period (and by 6.8 points relative to the Northeast). Thus, the Northeast and West both have relatively high levels of construction costs according to Table 3, but it is only the Northeast that has become increasingly expensive in recent years.

With respect to changes over time in the right-hand side regressors, the results in Table 4 provide an alternative estimate of the elasticity of supply of housing structures under the assumption that changes in demand are exogenous to changes in construction costs relative to the U.S. mean.[28] In this case, the point estimate of 0.017 on the change in the log of building permits once again suggests a very high elasticity of supply of structure (of 59~1/.017). The interquartile range of this variable runs from -0.34 to 0.47, for a difference of 0.81. Presuming that this is a reasonable change to consider, cost growth would be higher by 0.0146 or 1.46 percentage points.

The same comparison for real wage growth (i.e., from 2 percent at the 25th percentile to 13 percent at the 75th percentile) is associated with about a 1.3 percentage point higher growth rate for local construction costs. Stated differently, having six times the wage growth leads to only a little more than a 1 percentage point increase in construction cost growth.

There was considerable variation in how construction sector union penetration changed over this fifteen year period. An increase across the interquartile range of this

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[28] That is, the parameter on the change in permits must reflect the impact of an exogenous demand shock, which strikes us as more reasonable that assuming exogeneity of demand *levels* with respect to price *levels*.

variable, which runs from -10% at the 25th percentile to +5% in the 75th percentile, is associated with a 1.2 percentage point higher rate of cost growth. That is, having construction sector union penetration rise by 5 percent versus fall by 10 percent is associated with just over a 1 percent higher rate of cost growth. No other variables have statistically or economically meaningful impacts on the growth of costs.

If the forces that drove the evolution of construction costs between 1986 and 2000 continue, the dispersion of construction costs will be even higher in the future. A simple calculation assuming stable coefficients over the next 15 year period that only uses only the initial values of the variables as of 2000 predicts an increase of 14 percent in the standard deviation of construction costs from 2000-2014, with mean costs declining by a further 9 percent.[29] Highly unionized and northeastern markets become increasingly relatively expensive places in which to build in this scenario. Just how important that might be for urban redevelopment depends in large part on how many homes are priced close to construction costs in each market. It is to that issue that we now turn.

5. The Distribution of Price-to-Construction Cost across Markets

The special metropolitan area surveys in the *American Housing Survey* are used to compute kernel density estimates of the distribution of the value-to-cost ratio for the 29 markets tracked in their 1998-2002 data. Figure 8 contains the plot for each metropolitan area. Broadly speaking, each market can be put into one of three categories. One has systematically high land prices so that house prices clearly are not being pinned down by construction costs. These places include Anaheim, Boston, Los Angeles, Miami,

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[29] The initial period values explain about 60 percent of the variance in cost changes between 1986 and 2000.

Norfolk-Newport News, Phoenix, Portland (OR), Riverside, Salt Lake City, San Diego, San Francisco, and Washington, DC. In many of these areas, there is almost a uniform distribution around a modestly peaked price-to-construction cost ratio that is well above one, and there is only a small fraction of units with P/CC<1. A second type of area has a much more prominently single-peaked P/CC ratio slightly above one, but there still is significant mass below one. Chicago, Cincinnati, Columbus (OH), Dallas, Ft. Worth, Houston, Kansas City, Minneapolis, Providence, and Tampa are in this category. The third group of areas also has a prominently single-peaked P/CC distribution, but it occurs below one. Birmingham (AL), Baltimore, Buffalo, Detroit, Milwaukee, Philadelphia, and Rochester (NY) are in this group. Significant parts of these metropolitan areas must have suffered decline for so many homes to be valued below physical replacement cost.

There certainly are high construction costs markets in the first category of metropolitan areas, San Francisco prominent among them. It has the second highest construction costs in the country according to the figures in Table 2. However, even dramatic declines in building costs are not going to have much of an impact on the fraction of units priced below construction costs. In fact, only three percent of the San Francisco metropolitan area’s housing stock has a P/CC ratio below one. Therefore, even fairly large changes in construction costs there are unlikely to be much change in the incentives to redevelop the bulk of the stock.

It is in the metropolitan areas in the second and third categories that one would expect the evolution of the supply side to play a more important role in influencing whether significant parts of the housing stock will be redeveloped or be allowed to decline. Some insight into the practical relevance of this issue can be gained by estimating how much of each of these areas' housing stocks presently valued below construction costs would change to having a P/CC ratio above one if building costs in the area were equal to the national mean of $51.28/ft^2. In making this calculation, we use the results from columns 5 and 6 of Table 1 showing that, for metropolitan areas with relatively large fractions of their housing stocks priced below construction costs, the elasticity of the share of units with prices below replacement value with respect to increases in construction costs is about one. That is, we compute the share of units that would change their status from being valued below to above cost as log(local cost)-log($51.28) divided by the share of units currently valued below cost.

The top panel of Table 5 reports the results, with the first column listing local construction costs per square foot in 1999 and the second column providing the share of units valued below construction costs. We refer to the latter figure as the percentage in declining areas. If asset values are below construction costs, these units should decline with the owners not reinvesting much.

The local construction costs in column one first should be compared to the $51.28/ft^2 national average because there can be no effect for areas with below average costs. This is why the numbers in the third column of Table 5, which reflect the percentage of units that change from P/CC<1 to P/CC>1, are zero for Baltimore, Birmingham (AL), Cincinnati, Columbus (OH), Dallas, Ft. Worth, Houston, and Tampa. For relatively high cost markets, the fraction of presently 'below cost' homes (i.e., those with P/CC<1) that would be valued above cost if the areas could lower their building costs to the national average can be significant. We refer to these units as being 'recovered'. For Philadelphia, which has the highest construction costs of any metropolitan area listed in Table 5, nearly 15 percent of the 44.5 percent of its housing stock priced below physical replacement costs would change to having a P/CC ratio above one. Stated differently, a drop of 16 percent in local building costs would change the P/CC ratio from below to above one for 6.5 percent of the entire housing stock in the metropolitan area.

To provide an indication of the scale of housing involved, column 4 reports the number of owner-occupied units affected. These figures are the product of the following three terms: (a) the percentage of units with P/CC<1 from column 2; (b) the fraction of units with P/CC<1 that 'recover' and move above 1 from column 3; and (c) the total number of owner-occupied homes in the metropolitan area. For large metropolitan areas such as Chicago and Philadelphia, from 86,000-122,000 homes move from being valued below to above cost. Clearly, more than a few neighborhoods are being affected.

Columns 5 and 6 then report the fractions of owner-occupied housing in the central city and suburban parts of the metropolitan area whose P/CC ratios move above one. For the cities of Chicago and Philadelphia, about 10 percent of their local housing stocks would be 'recovered' and have P/CC ratios above 1 if they could have the average construction costs for the nation.[30]

The final column of Table 5 reports an estimate of how much more metro-wide reinvestment would occur due to the 'recovery' of 'declining' homes. This estimate is based on Gyourko and Saiz's (2004) finding that owners of homes with market values below replacement costs spend up to 50 percent less on renovation and maintenance than do owners of similar homes with market values above construction costs. Their preferred

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[30] The *AHS* reports a central city identifier, but does not provide finer geocoding. Hence, we cannot identify specific neighborhoods.

estimate indicates that, on the margin, annual spending on renovation and maintenance increases by $911 when the home changes from being valued below replacement cost to being priced above that cost.[31] If every owner whose home changed its status from being below to above construction cost reinvested an additional $911, the extra spending would equal that reported in column 7 of Table 5. Of course, not everyone is marginal, so these figures are upper bounds. Still, they indicate that many more millions of dollars would be reinvested in the local housing stocks of places like Chicago and Philadelphia if construction costs could be reduced.

We then repeat this exercise assuming construction costs could fall to the level in the metropolitan area ranked in the 25th percentile of the cost distribution ($\$46.19/\text{ft}^2$) and report the results in the bottom panel of Table 5. It is not uncommon to see 25-33 percent of the 'below cost' units changing to have P/CC ratios above 1. In Philadelphia's case, the findings imply that 11 percent of the metropolitan area housing stock would move from being below to above cost. Reinvestment in the housing stock would increase by $134 million if it could somehow achieve Miami's construction cost level.

These findings suggest that there are economically meaningful impacts associated with lowering building costs in areas with both high construction costs and relatively large fractions of units priced below, but still close to, physical replacement costs. The latter trait is characteristic of areas that have not been thriving. If there is a moral to this research, it is that such places cannot afford to be expensive. While materially reducing construction costs may be very difficult, strategies that contain cost growth relative to

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[31] Annual spending on maintenance and renovation is high. Data from the *AHS* over the 1984-1993 sample period used in Gyourko and Saiz (2004) indicates that average expenditures were $1,973 per house.

home value appreciation could be very effective over the long run in helping areas revitalize.

6. Conclusions

Average house prices are close to construction costs in much of the country. Thus, on the margin, high or increasing construction costs could help account for the lack of redevelopment in areas with little or no positive price appreciation. The stylized facts are that there are economically significant differences in costs across markets. Moreover, there are many slow growth or declining markets that have very high physical production costs. Finally, construction costs have been declining in recent decades, both at the mean and across the interquartile range of metropolitan areas. However, the dispersion in costs has been increasing, relatively and absolutely.

What drives differences in the level of construction costs across markets? It is not the scale of building activity in a market. Physical structure is in very elastic supply. This indicates that a city suffering a negative demand shock and experiencing lower levels of new construction will not have lower costs due to any technological factor. The bulk of the cross-sectional variation of constructions costs is explained by a handful of supply shifters, regional fixed effects and the unionization rate in the construction sector most prominently.

A simple model of the evolution of costs accounted for about 70 percent of the variance in the within-city growth rate of construction costs between 1986 and 2000. The most important correlate of cost growth during those 15 years turns is the initial unionization rate in the construction sector. The evolution of wages and regional effects are also relevant. We also confirm the high elasticity of the supply of structures using long differences in the log of costs.

We concluded by showing that the current distribution of construction costs across markets is relevant to many areas with both high construction costs and significant fractions of their housing stock with values below, but still close to, replacement cost. Over 10 percent of the city of Philadelphia's housing stock would change from being valued below to above replacement costs if construction costs were no more than the national average. Nearly 18 percent of the Philadelphia city's owner-occupied stock would be similarly affected if it could achieve Miami, Florida's level of construction costs, which would put it in the 25th percentile of the cost distribution.

While keeping costs down clearly are important especially for markets suffering from weak demand, we hasten to add that this does not imply that many possible supply-side policy interventions, including subsidizing construction costs in high cost areas, would be efficiency enhancing. Lowering the real resource costs of building through more efficient production obviously would be beneficial. However, subsidizing inefficiently high building cost areas generally is no better a policy than subsidizing an inefficiently high cost producer in the private sector.

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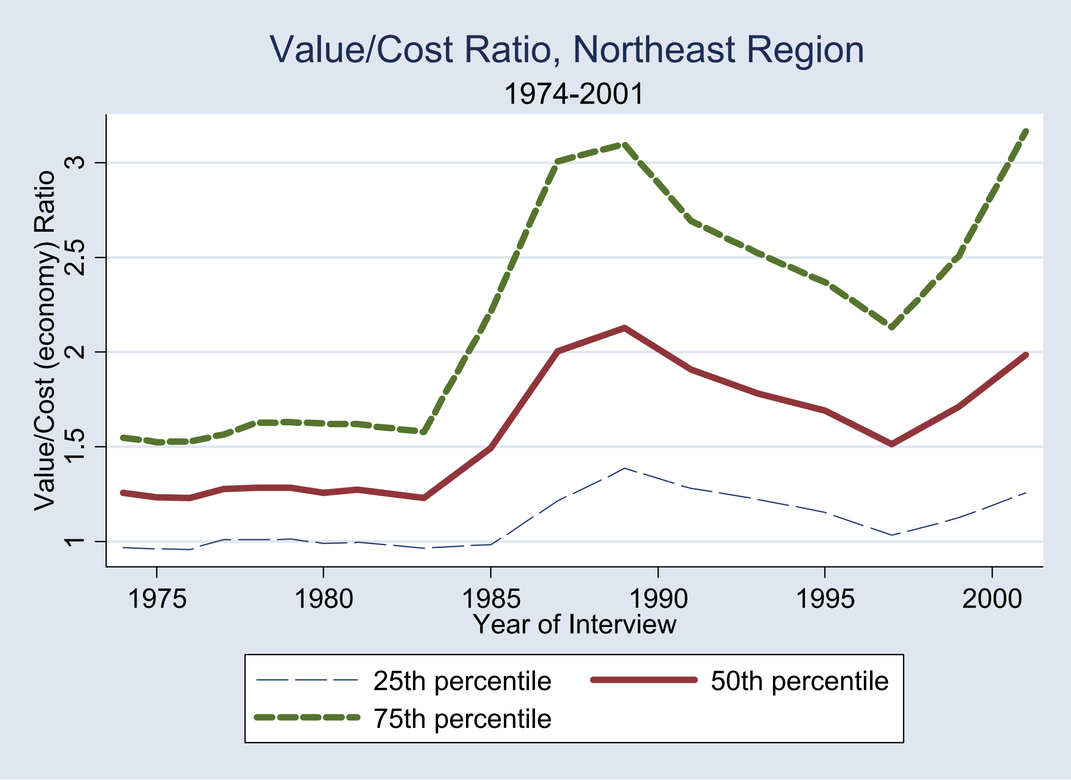
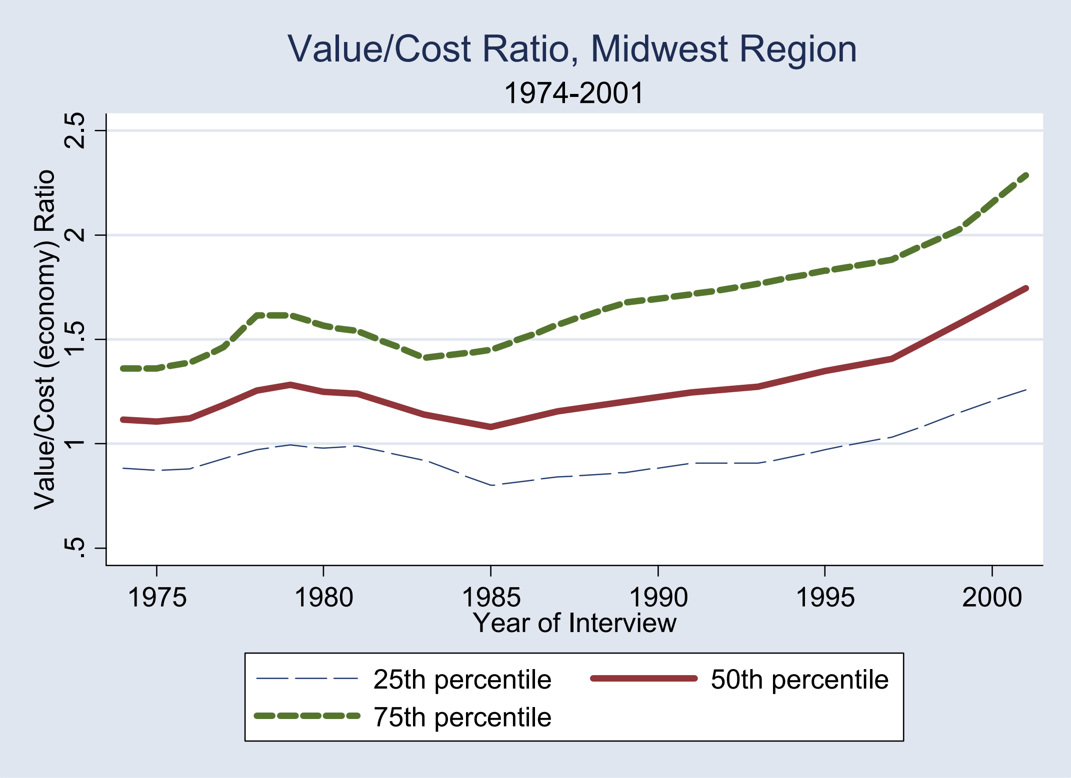
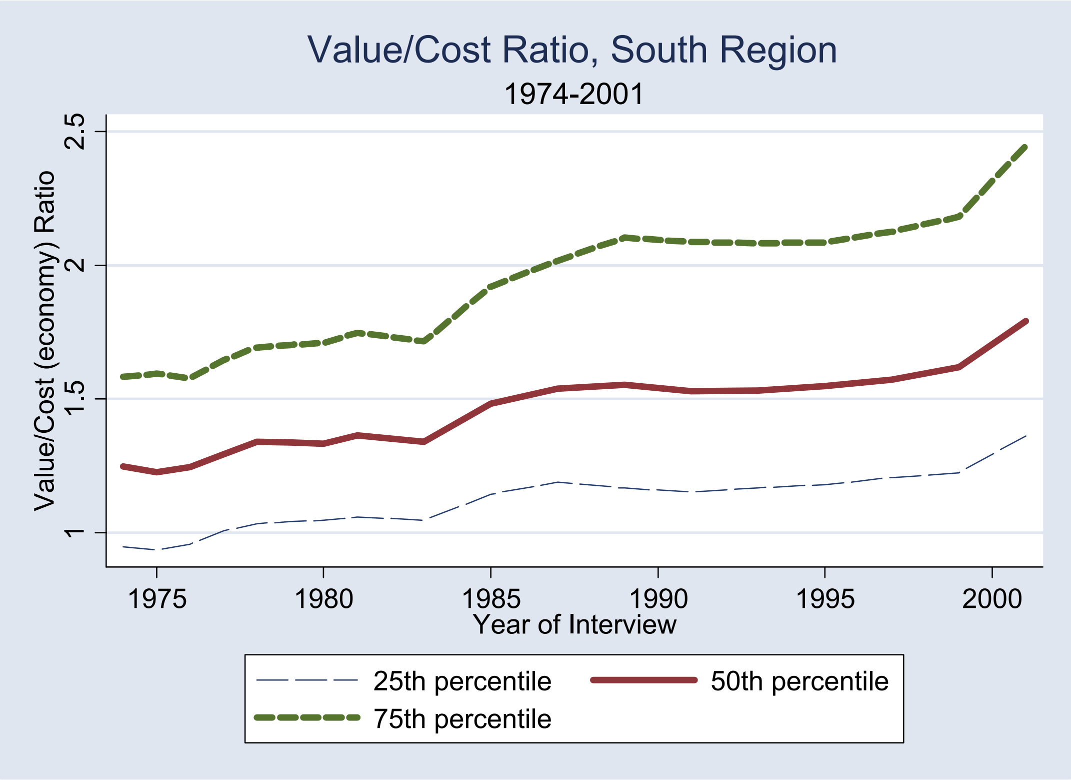
Figures 1 to 4: Value/Cost Ratio by Region and Year






Value/Cost Ratio, South Region
1974-2001
Value/Cost (economy) Ratio
2.5
2
1.5
1
1975
1980
1985
1990
1995
2000
Year of Interview
25th percentile
50th percentile
75th percentile

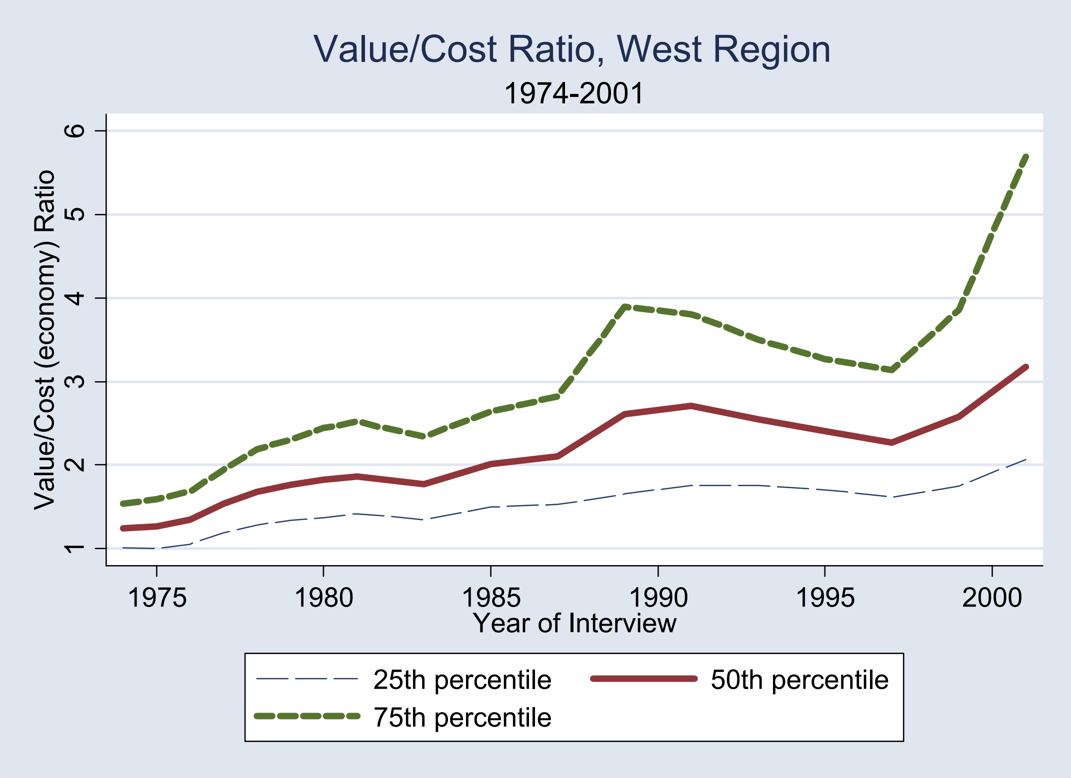

Value/Cost Ratio, West Region
1974-2001
Value/Cost (economy) Ratio
6
5
4
3
2
1
1975
1980
1985
1990
1995
2000
Year of Interview
25th percentile
50th percentile
75th percentile

Figure 5: House Values and Housing Start Permits (1999)

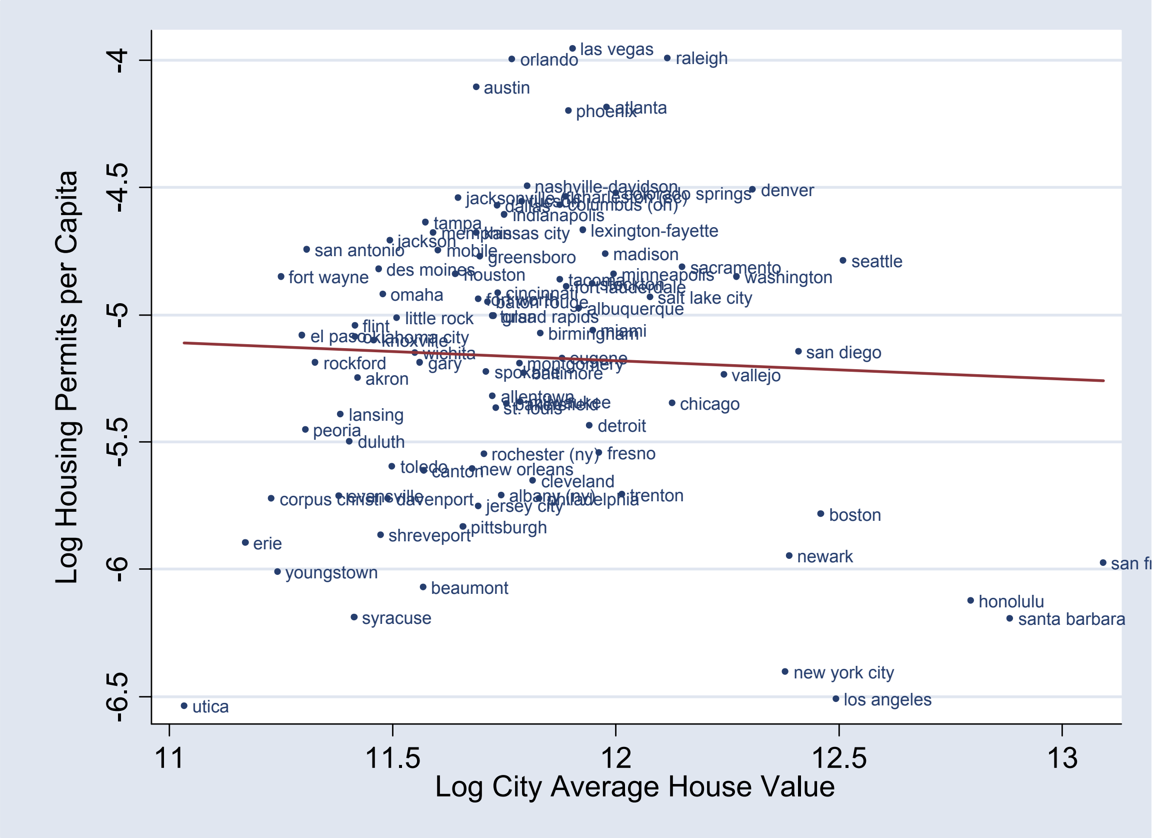
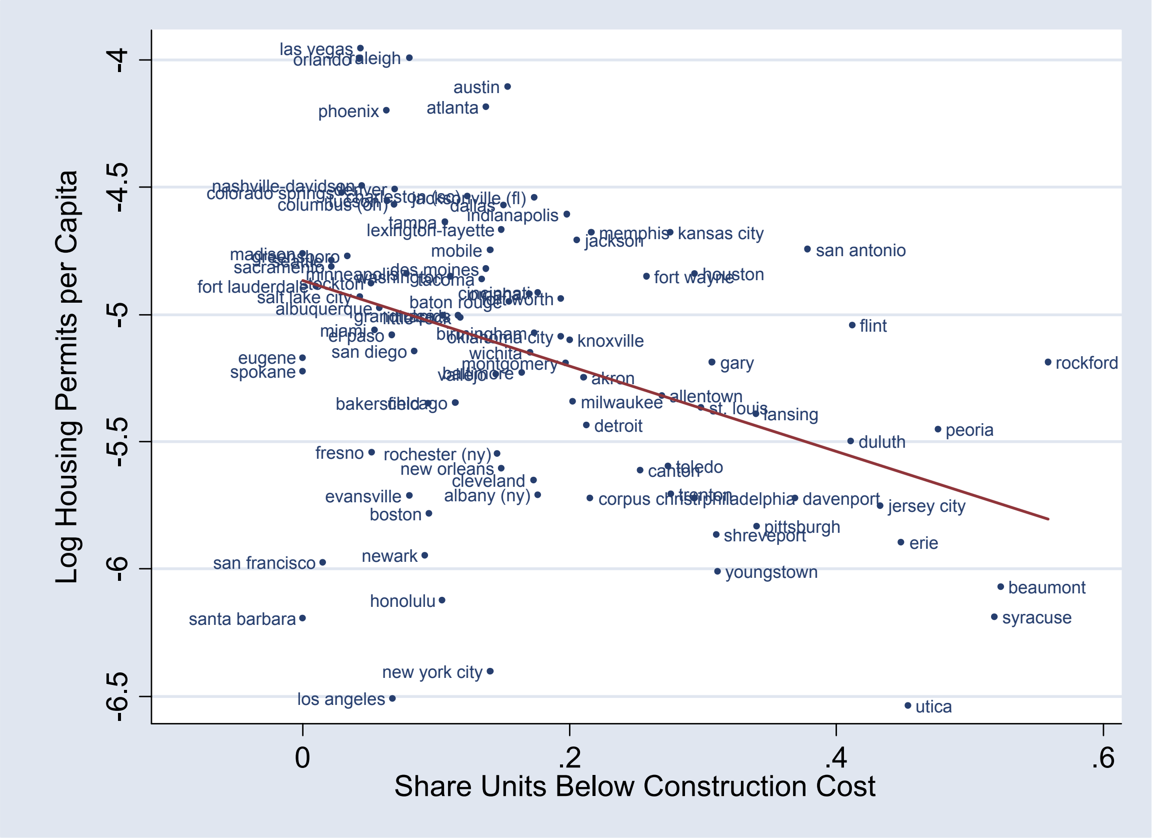


Figure 6: Share of Units with Values Below Costs and Housing Start Permits (1999)



The regression line is as follows (standard errors below estimates in parentheses – R-squared=0.15)

Log permits	=	-4.86	-	1.68	*	**Share Units Below Cost**
		(0.09)		(0.41)		

Figure 7: Unionization (1986) and the evolution of construction costs (1986-2000)

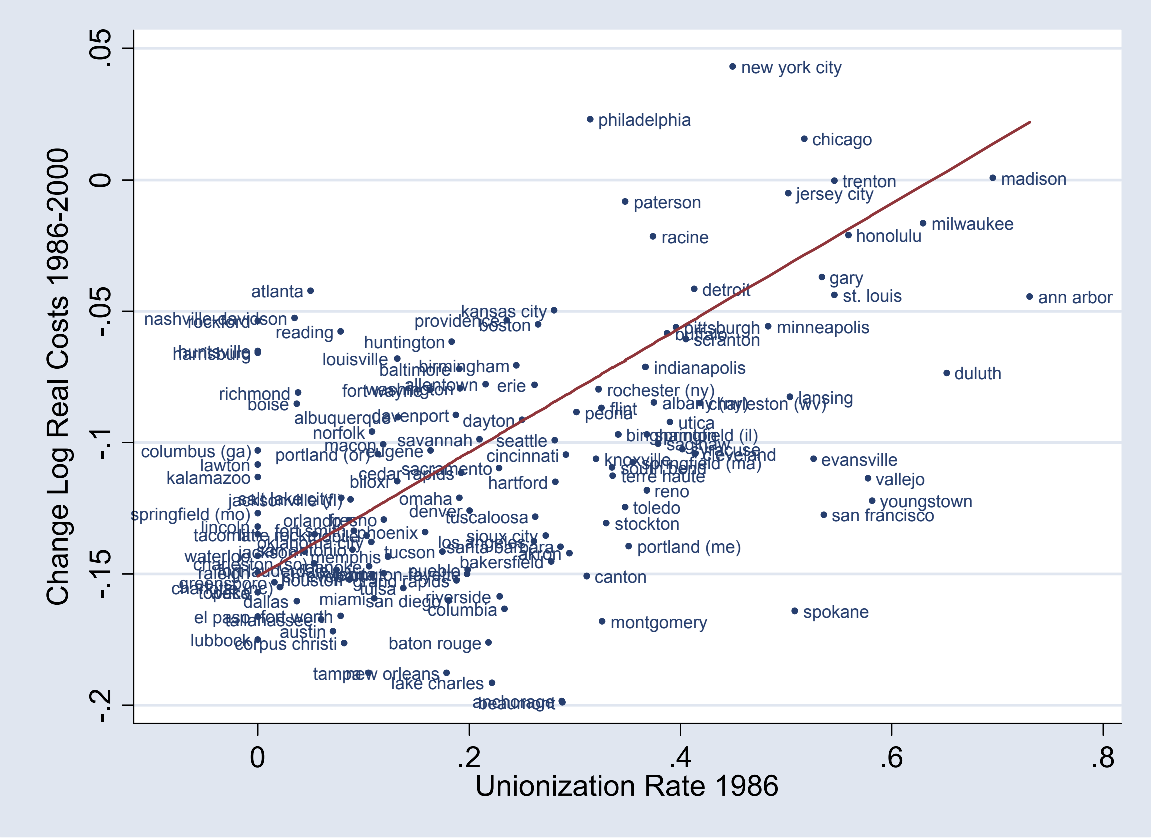
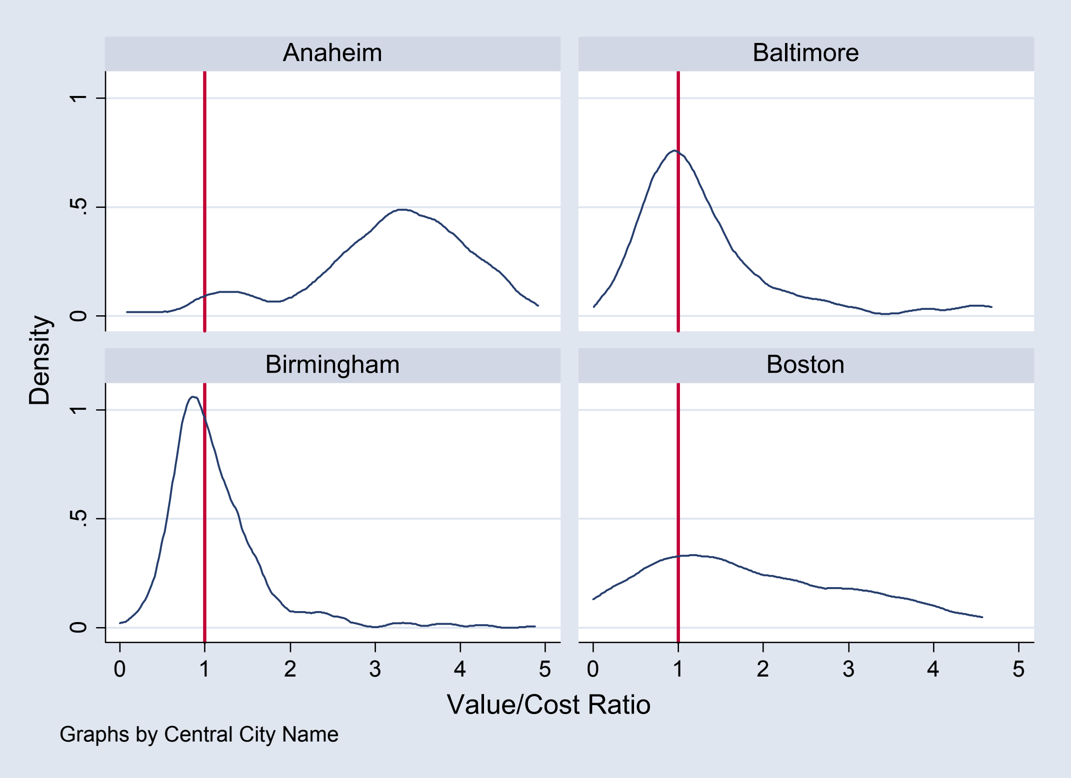
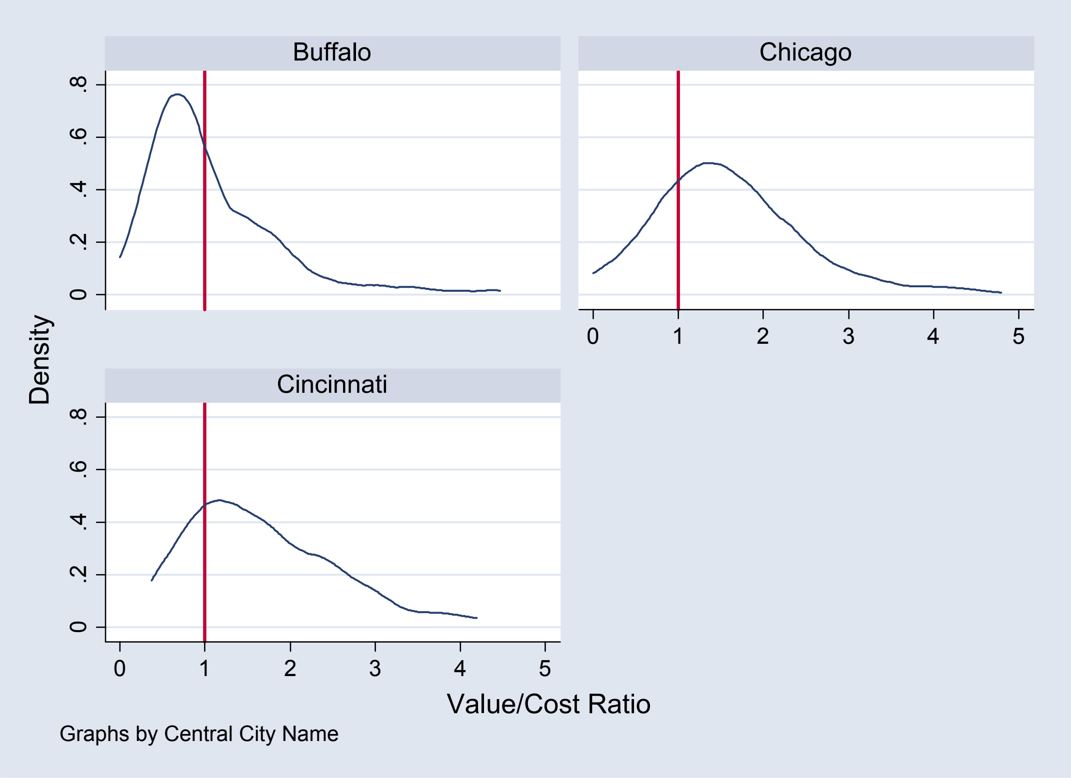
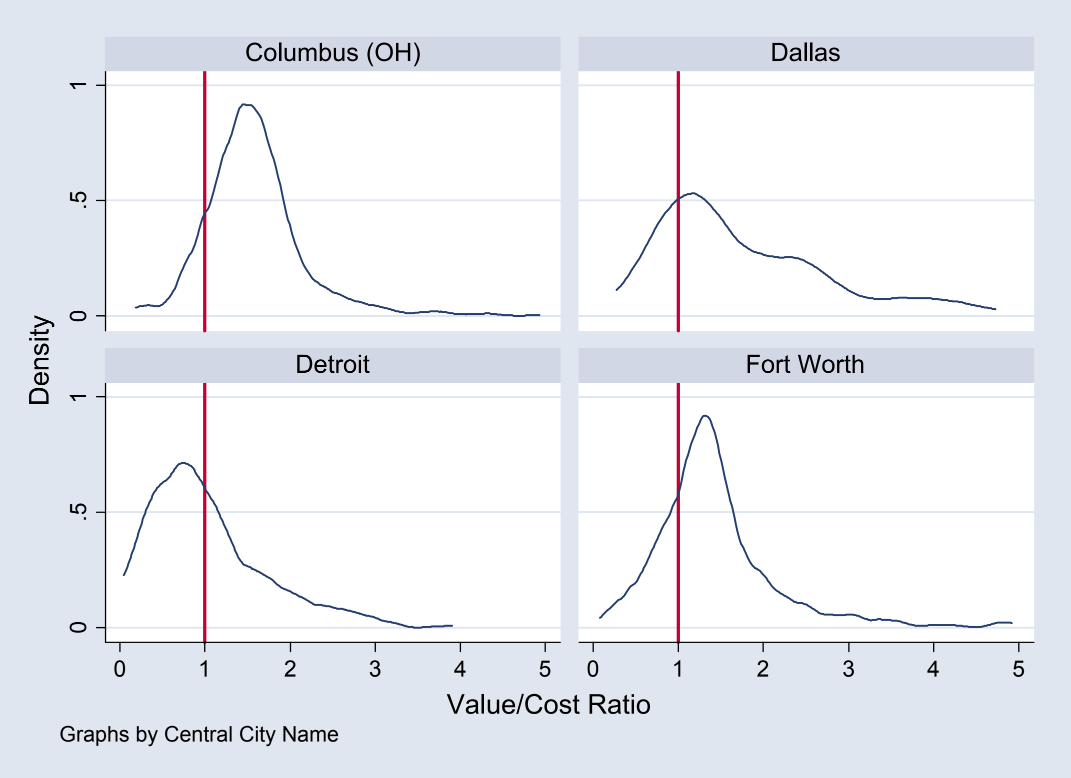
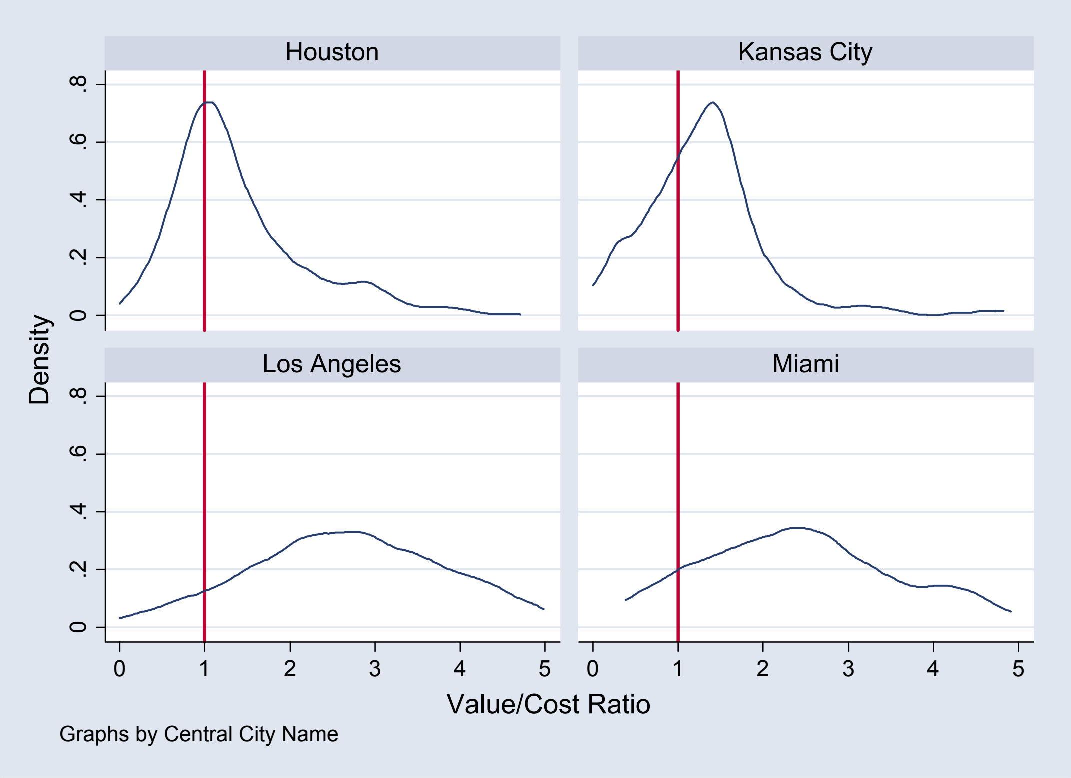


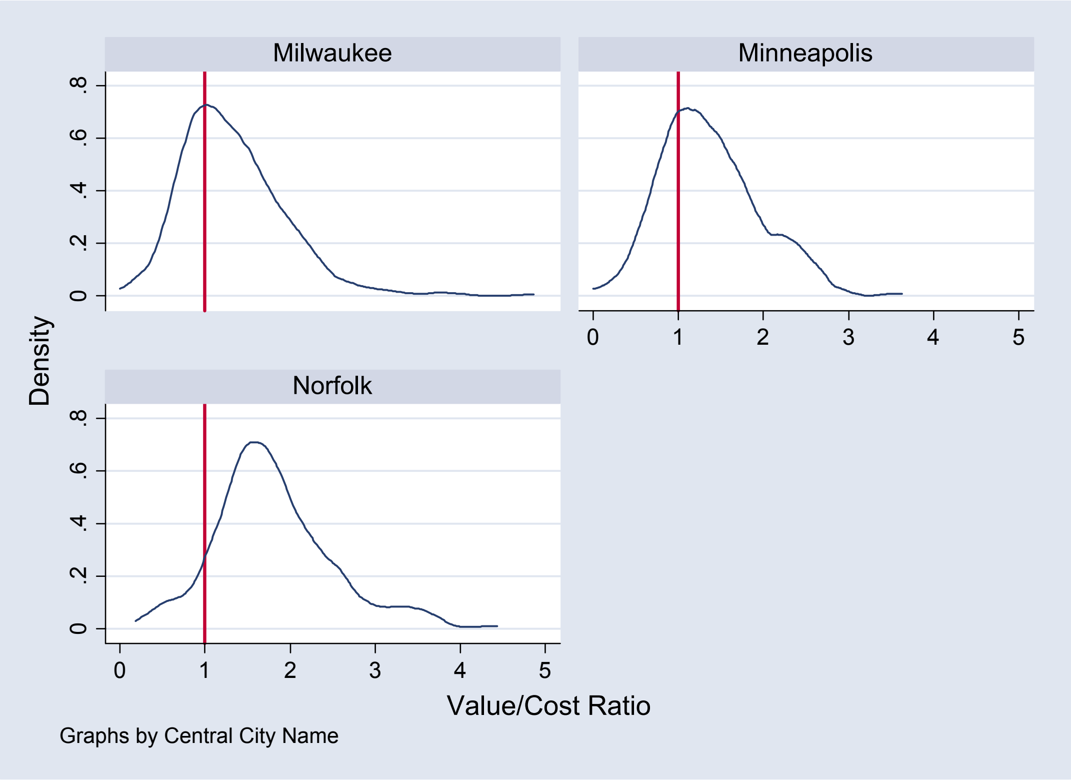
Figure 8: The Distribution of Housing Value/Cost Ratios

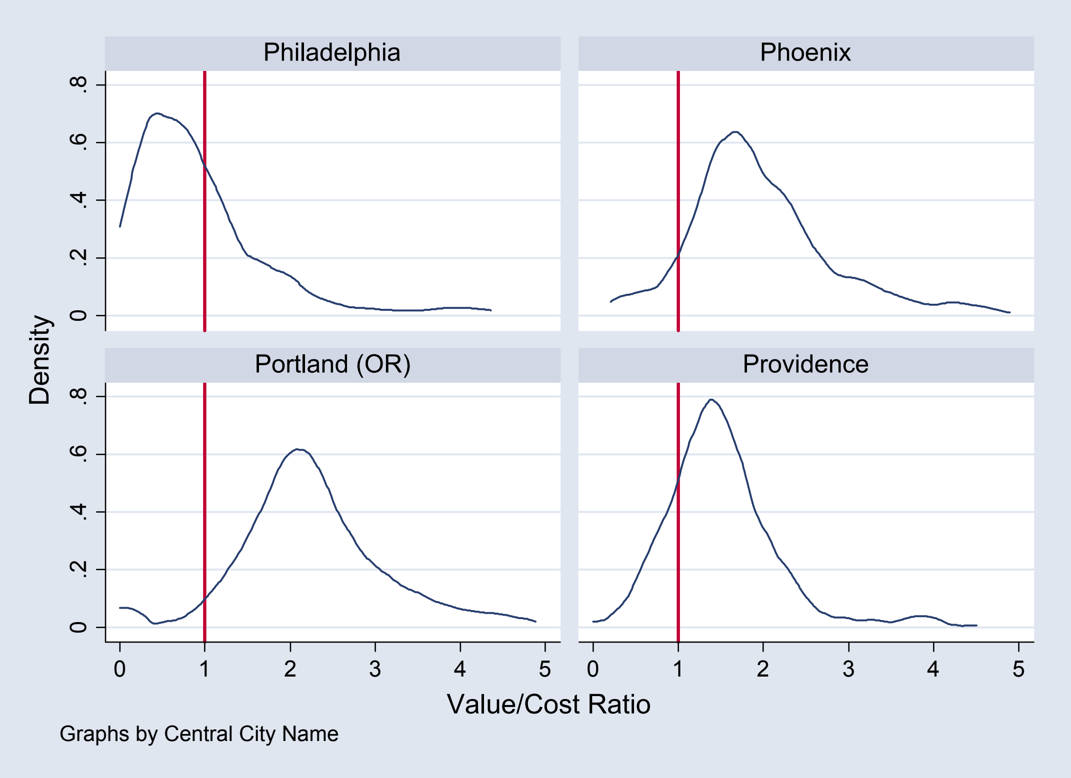


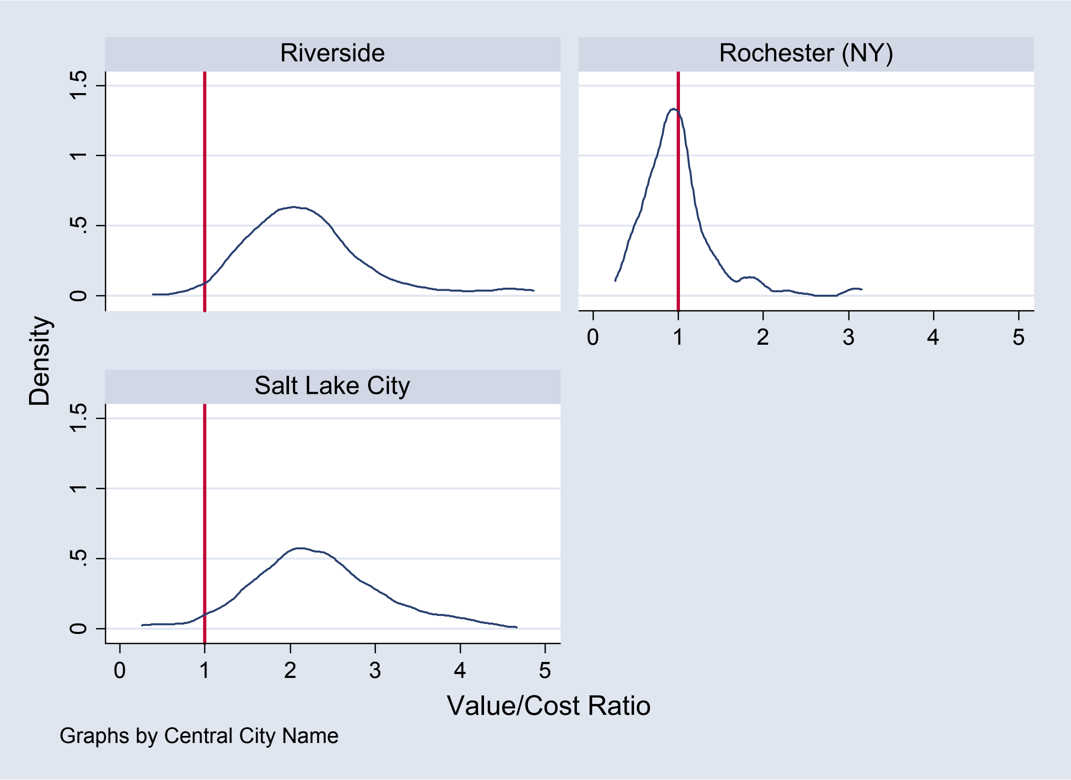



Columbus (OH)
Dallas
Detroit
Fort Worth
Density
0
.5
1
0
1
2
3
4
5
Value/Cost Ratio
Graphs by Central City Name

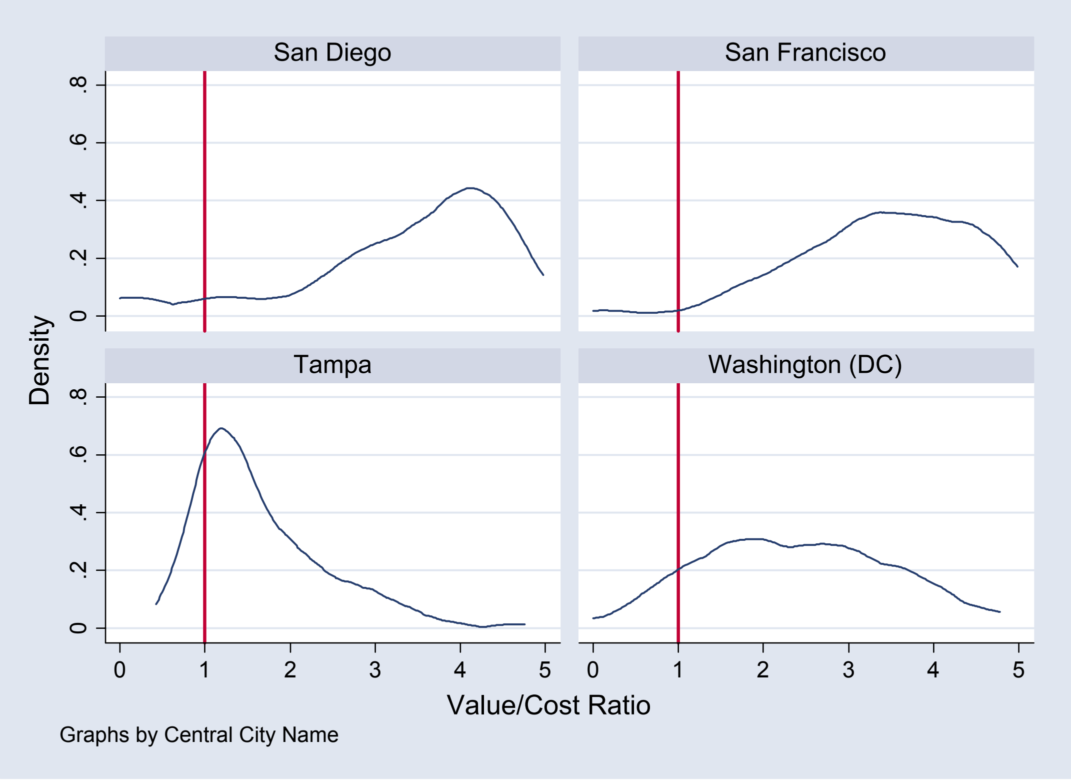

Houston
Kansas City
Los Angeles
Miami
Density
0
.2
.4
.6
.8
0
1
2
3
4
5
Value/Cost Ratio
Graphs by Central City Name


Milwaukee
Minneapolis
Norfolk
Density
0
.2
.4
.6
.8
0
1
2
3
4
5
Value/Cost Ratio
Graphs by Central City Name


Philadelphia
Phoenix
Portland (OR)
Providence
Density
0
.2
.4
.6
.8
0
1
2
3
4
5
Value/Cost Ratio
Graphs by Central City Name



Graphs by Central City Name



Graphs by Central City Name

TABLE 1

Construction Costs and Housing Values

	Log City Average House Value		Share Units Below Construction Cost		Share Units Below Construction Cost - Declining Areas	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Log City Construction Cost, 2000 Sq.ft. unit	**0.857**	**0.69**	**0.084**	**0.318**	**1.105**	**1.159**
	(0.204)***	(0.192)***	(0.152)	(0.152)**	(0.400)***	(0.386)***
Log City Average Household Income		0.438		-0.09		0.323
		(0.125)***		(0.029)***		(0.260)
Log Within-City Income Standard Deviation		0.078		-0.002		-0.011
		(0.017)***		(0.019)		(0.036)
Log Employment		0.396		-0.248		-0.457
		(0.091)***		(0.050)***		(0.151)***
Year Fixed Effects	yes	yes	yes	yes	yes	yes
MSA Fixed Effects	yes	yes	yes	yes	yes	yes
AR(1)	yes	yes	yes	yes	yes	yes
Observations	1426	1262	1426	1262	423	409
Number of smsa code	108	99	108	99	35	35

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 2

Housing Construction Costs Are Heterogeneous

		Construction costs per square feet - Economy quality (2001 $)			Construction costs per square feet - Economy quality (2001 $)
1	New York City	71.45	**26**	Denver	50.00
2	San Francisco	66.50	**27**	Cincinnati	49.45
3	Honolulu	65.53	**28**	Baltimore	48.76
4	Boston	62.42	**29**	Phoenix	48.35
5	Newark	60.31	**30**	Houston	47.94
6	Philadelphia	59.49	**31**	Salt Lake City	47.89
7	Chicago	59.39	**32**	Tucson	47.34
8	Sacramento	59.30	**33**	Atlanta	47.16
9	Los Angeles	58.98	**34**	Fort Lauderdale	46.47
10	Fresno	58.16	**35**	Birmingham	46.38
11	Minneapolis	57.97	**36**	Dallas	46.29
12	San Diego	57.24	**37**	Grand Rapids	46.24
13	Seattle	56.51	**38**	Miami	46.20
14	Detroit	56.19	**39**	Orlando	45.87
15	Las Vegas	55.86	**40**	Memphis	45.69
16	St. Louis	54.90	**41**	New Orleans	45.60
17	Pittsburgh	54.81	**42**	Nashville-Davidson	45.19
18	Cleveland	54.40	**43**	Jacksonville (FL)	44.91
19	Milwaukee	53.80	**44**	San Antonio	44.91
20	Rochester (NY)	53.53	**45**	Tampa	44.87
21	Kansas City	52.66	**46**	Fort Worth	44.73
22	Albany	52.52	**47**	Oklahoma City	44.64
23	Washington	51.10	**48**	Austin	44.00
24	Indianapolis	50.69	**49**	Raleigh	41.47
25	Columbus (OH)	50.18	**50**	Greensboro	41.38

TABLE 3

Accounting for Construction Costs: Cross Section

	Log Cost Sq.Ft. Economy 2000 ft. Home				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Log Total Housing Permits	0.015	-0.014	-0.009	-0.009	0.026
	(0.013)	(0.010)	(0.008)	(0.008)	(0.012)**
Log Average Wage Receipts per Worker		0.42	0.327	0.327	0.175
		(0.108)***	(0.085)***	(0.085)***	(0.069)**
Log MSA Density		0.0002	0.01	0.011	0.014
		(0.011)	(0.009)	(0.009)	(0.006)**
Unionization Share, Construction Industry		0.346	0.271	0.273	0.207
		(0.049)***	(0.072)***	(0.069)***	(0.032)***
Log Inspection Expenditures per Capita		0.043	0.02	0.02	0.013
		(0.011)***	(0.007)***	(0.007)***	(0.008)*
Northeast			0.076	0.076	0.091
			(0.022)***	(0.020)***	(0.021)***
South			-0.023	-0.023	-0.054
			(0.025)	(0.027)	(0.015)***
West			0.113	0.112	0.09
			(0.021)***	(0.022)***	(0.017)***
Unionization Share, Durable Goods				-0.007	0.042
				(0.040)	(0.041)
Year Fixed Effects	yes	yes	yes	yes	yes
IV	no	no	no	no	yes
Observations	2239	2185	2185	2172	2051
R-squared	0.09	0.66	0.8	0.8	0.81

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 4

Accounting for Construction Costs: Growth (1986-2000)

	Δ Log Real Construction Costs (1986-2000)
Δ Log Construction Permits (1986-2000)	0.017
	(0.009)**
Δ Log Average Wage Receipts per Worker (1986-2000)	0.124
	(0.053)**
Δ Log MSA Density (1986-2000)	0.046
	(0.050)
Δ Unionization Rate - Construction (1986-2000)	0.068
	(0.040)*
Δ Log Inspection Spending per Capita (1986-2000)	0.001
	-0.005
Δ Unionization Rate - Durables (1986-2000)	0.058
	(0.045)
Log Total Housing permits - 1986	0.009
	(0.005)*
Log Average Wage Receipts per Worker - 1986	0.005
	(0.041)
Log MSA Density - 1986	0.008
	(0.006)
Unionization , Construction Industry - 1986	0.191
	(0.037)***
Log Inspection Expenditures per Capita - 1986	-0.005
	(0.007)
Unionization , Durables - 1986	0.062
	(0.040)
Northeast	0.042
	(0.014)***
South	-0.005
	(0.013)
West	-0.024
	(0.014)*
Constant	-0.333
	(0.404)
Observations	130
R-squared	0.71

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 5

Simulated Effect of Cost Reductions on Declining Areas (Metro AHS-1998-2002)

Simulation/Panel 1: Reducing Costs to Mean

	Construction Costs (1999)	Percentage in declining areas	Percentage of declining housing stock "recovered"	# of units "recovered" (MSA)	Percentage of central city housing stock "recovered"	Percentage of suburban housing stock "recovered"	Added Investment (Gyourko and Saiz, 2004)
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Baltimore	48.76	18.30%	0.00%	0	0.00%	0.00%	$0
Birmingham	46.38	39.28%	0.00%	0	0.00%	0.00%	$0
Buffalo	55.09	58.15%	**5.35%**	**9,640**	**3.30%**	**3.07%**	$8,782,344
Chicago	59.39	20.94%	**30.45%**	**122,474**	**9.55%**	**4.73%**	$111,573,946
Cincinnati	49.45	27.16%	0.00%	0	0.00%	0.00%	$0
Columbus (OH)	50.18	23.11%	0.00%	0	0.00%	0.00%	$0
Dallas	46.29	21.06%	0.00%	0	0.00%	0.00%	$0
Detroit	56.19	33.32%	**11.90%**	**48,671**	**8.08%**	**2.90%**	$44,338,967
Fort Worth	44.73	26.41%	0.00%	0	0.00%	0.00%	$0
Houston	47.94	51.57%	0.00%	0	0.00%	0.00%	$0
Kansas City	52.66	37.65%	**3.05%**	**5,425**	**1.42%**	**1.08%**	$4,941,975
Milwaukee	53.80	29.45%	**7.08%**	**7,483**	**3.51%**	**1.54%**	$6,817,066
Minneapolis	57.97	34.31%	**15.53%**	**43,855**	**5.92%**	**5.26%**	$39,951,491
Philadelphia	59.49	44.45%	**14.50%**	**86,215**	**10.45%**	**4.76%**	$78,541,727
Providence	55.73	24.78%	**14.57%**	**8,070**	**5.48%**	**2.98%**	$7,351,359
Rochester (NY)	53.53	44.93%	**4.14%**	**5,334**	**3.06%**	**1.69%**	$4,859,626
Tampa	44.87	22.01%	0.00%	0	0.00%	0.00%	$0

Simulation/Panel 2: Reducing Costs to 25 Percentile

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Baltimore	48.76	18.30%	**12.83%**	**15,305**	**5.05%**	**1.68%**	$13,943,189
Birmingham	46.38	39.28%	**0.44%**	**440**	**0.28%**	**0.14%**	$400,414
Buffalo	55.09	58.15%	**13.15%**	**23,710**	**8.10%**	**7.56%**	$21,599,959
Chicago	59.39	20.94%	**52.11%**	**209,579**	**16.34%**	**8.09%**	$190,926,796
Cincinnati	49.45	27.16%	**10.88%**	**12,627**	**4.19%**	**2.73%**	$11,503,483
Columbus (OH)	50.18	23.11%	**15.56%**	**13,684**	**4.37%**	**3.11%**	$12,465,927
Dallas	46.29	21.06%	**0.41%**	**650**	**0.14%**	**0.07%**	$592,333
Detroit	56.19	33.32%	**25.52%**	**104,329**	**17.32%**	**6.21%**	$95,043,809
Fort Worth	44.73	26.41%	0.00%	0	0.00%	0.00%	$0
Houston	47.94	51.57%	**3.12%**	**13,997**	**1.68%**	**1.56%**	$12,751,186
Kansas City	52.66	37.65%	**15.10%**	**26,829**	**7.01%**	**5.32%**	$24,441,021
Milwaukee	53.80	29.45%	**22.48%**	**23,768**	**11.14%**	**4.88%**	$21,652,223
Minneapolis	57.97	34.31%	**28.75%**	**81,201**	**10.96%**	**9.73%**	$73,974,142
Philadelphia	59.49	44.45%	**24.71%**	**146,895**	**17.81%**	**8.11%**	$133,821,195
Providence	55.73	24.78%	**32.87%**	**18,207**	**12.36%**	**6.73%**	$16,586,238
Rochester (NY)	53.53	44.93%	**14.24%**	**18,330**	**10.51%**	**5.79%**	$16,698,907
Tampa	44.87	22.01%	0.00%	0	0.00%	0.00%	$0

Formulae: (3) = {log(costs)-log(51.28)} / (2)
(4) = (2) * (3) * Number of Owner Occupied Units in MSA
(5) = (3) * Percentage Declining Stock in Central City
(6) = (3) * Percentage Declining Stock in Suburbs
(7) = (6) * behavioral effect on reinvestment from Gyourko and Saiz (2004)

Appendix TABLE 1

Unionization in the Construction Sector

		Share Unionized (average CPS 1986-2000)			Share Unionized (average CPS 1986-2000)
1	St. Louis	52.16%	**26**	San Diego	22.15%
2	Chicago	49.08%	**27**	Grand Rapids	18.79%
3	Minneapolis	46.00%	**28**	New Orleans	17.20%
4	Milwaukee	43.73%	**29**	Baltimore	16.92%
5	New York City	42.24%	**30**	Columbus (OH)	16.18%
6	San Francisco	41.60%	**31**	Denver	15.47%
7	Detroit	39.07%	**32**	Washington	14.77%
8	Newark	37.18%	**33**	Anaheim	14.65%
9	Paterson	37.15%	**34**	Memphis	13.05%
10	Cleveland	36.15%	**35**	Salt Lake City	12.53%
11	Buffalo	35.42%	**36**	Oklahoma City	11.33%
12	Pittsburgh	34.76%	**37**	Phoenix	10.65%
13	Philadelphia	32.68%	**38**	Miami	10.57%
14	Rochester (NY)	31.02%	**39**	Atlanta	9.70%
15	Seattle	30.07%	**40**	Nashville-Davidson	9.50%
16	Kansas City	29.52%	**41**	Fort Lauderdale	8.56%
17	Boston	29.41%	**42**	Houston	8.16%
18	Portland (OR)	26.78%	**43**	Norfolk	7.16%
19	Las Vegas	26.67%	**44**	Fort Worth	5.96%
20	Hartford	26.57%	**45**	Orlando	5.37%
21	Los Angeles	24.92%	**46**	Dallas	5.28%
22	Riverside	24.56%	**47**	San Antonio	5.14%
23	Indianapolis	23.66%	**48**	Tampa	4.59%
24	Sacramento	23.52%	**49**	Greensboro	2.09%
25	Cincinnati	22.59%	**50**	Charlotte (NC)	1.42%

Note: Metropolitan areas with average population over 1 million during the 1986-2000 period.

Appendix TABLE 2

Accounting for Wages in the Construction Sector: Cross Section

	Log hourly wage in construction sector				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Log Total Housing permits at T-1	0.021	0.001	0.002	0.001	-0.012
	(0.015)	(0.010)	(0.009)	(0.009)	(0.018)
Log Average Wage Receipts per Worker		0.482	0.447	0.447	0.456
		(0.123)***	(0.113)***	(0.112)***	(0.101)***
Log MSA Density		-0.034	-0.024	-0.023	-0.019
		(0.013)**	(0.014)*	(0.014)*	-0.012
Unionization Share, Construction Industry		0.629	0.568	0.575	0.475
		(0.046)***	(0.082)***	(0.080)***	(0.050)***
Log Inspection Expenditures per Capita		0.035	0.019	0.018	0.028
		(0.009)***	(0.008)**	(0.008)**	(0.011)**
Northeast			0.002	-0.0005	-0.013
			(0.021)	(0.021)	(0.024)
South			-0.032	-0.035	-0.077
			(0.030)	(0.031)	(0.019)***
West			0.054	0.05	0.016
			(0.030)*	(0.030)*	-0.027
Unionization Share, Durable Goods				-0.03	-0.081
				(0.045)	(0.059)
Year Fixed Effects	yes	yes	yes	yes	yes
IV	no	no	no	no	yes
Observations	2233	2185	2185	2172	2051
R-squared	0.03	0.56	0.58	0.58	0.58

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix TABLE 3

Predicted real Construction Costs (2014)

	MSA	Predicted Construction costs per square feet in 2014- Economy quality (2001 $)		MSA	Predicted Construction costs per square feet in 2014- Economy quality (2001 $)
1	New York City	71.37	**26**	Cincinnati	45.06
2	San Francisco	61.21	**27**	Denver	44.42
3	Boston	60.38	**28**	Baltimore	44.09
4	Honolulu	59.77	**29**	Atlanta	43.09
5	Newark	58.70	**30**	Houston	42.65
6	Chicago	58.26	**31**	Grand Rapids	41.86
7	Philadelphia	57.94	**32**	Phoenix	41.70
8	Minneapolis	55.62	**33**	Salt Lake City	41.67
9	Detroit	53.81	**34**	Fort Lauderdale	41.63
10	Pittsburgh	53.10	**35**	Dallas	41.41
11	Los Angeles	52.72	**36**	Miami	41.07
12	Milwaukee	52.53	**37**	Orlando	40.69
13	Sacramento	52.53	**38**	Birmingham	40.56
14	St. Louis	52.50	**39**	New Orleans	40.45
15	Cleveland	51.56	**40**	Nashville-Davidson	40.44
16	Seattle	51.30	**41**	San Antonio	40.33
17	Fresno	51.00	**42**	Memphis	40.32
18	San Diego	50.97	**43**	Tucson	40.19
19	Rochester (NY)	50.10	**44**	Tampa	39.80
20	Albany	49.79	**45**	Fort Worth	39.47
21	Las Vegas	49.38	**46**	Jacksonville (FL)	39.25
22	Kansas City	48.92	**47**	Austin	38.69
23	Indianapolis	46.77	**48**	Oklahoma City	38.68
24	Washington	46.12	**49**	Raleigh	36.21
25	Columbus (OH)	45.97	**50**	Greensboro	35.92

Data Appendix

Variable	**Data Notes**	**Source**	**Use**
Value/Cost Ratio	We adjust reported AHS (Metropolitan and National samples) house values to estimate the "*as if new*" price of each housing unit. We estimate construction costs for an economy home using the Means and Co. data. See note ‡-b for more details.	National AHS, 1974-2001 Metropolitan AHS, 1998-2001 Residential Cost Data and Square Foot Costs (several years) - R.S. Means Company	Figures 1-4 Figure 7
Log MSA Average House Value	We calculate average home value (from self-reported data) by metropolitan area and year	National AHS, 1974-2001	T.1, Figure 5, Figure 6
Log MSA per Capita Income		Bureau of Economic Analysis (BEA)	T.1
Log within-city Income Standard Deviation	Calculated from the AHS samples	National AHS, 1974-2001	T.1
Log Employment		BEA	T.1
Share of units Below Construction cost	Using the previous variable, we generate a dummy that takes value one for a unit in the AHS if the home price is below construction costs. Then we average the dummy within an MSA and year.	National AHS, Residential Cost Data and Square Foot Costs (several years) - R.S. Means Company	T.1, T.2, Figure 5
Log Cost Per Square Foot, Economy-Quality, 2000 ft^2 Home	We focus on costs for a basic, economy (lowest) quality house of 2,000 sq.ft. with the mean cost associated with four possible types of siding and building frame. See note ‡-b for more details.	Residential Cost Data and Square Foot Costs (several years) - R.S. Means Company	T.1, T.3, T.4, A.T.1, A.T.2 Figure 6
Log Total Housing Permits	New housing permits at the metropolitan area level. We generate this variable by adding permits at the county level using MSA/NECMA definitions	Census Housing Units Authorized by Building Permits C40 series	T.3, T.4, A.T.2, Figure 5
Log Average Wage Receipts per Worker		Bureau of Labor Statistics (Metropolitan Area Occupational Employment and Wage Estimates)	T.3,T.4, A.T.2
Log MSA Density	We add population estimates and area estimates by county at the metropolitan area level. Density is defined as MSA population over MSA		T.3,T.4, A.T.2
Share Union Construction Workers	Average share of respondents in construction sector reporting union enrollment by metropolitan area: 1986-2000	Current Population Survey. Monthly Outgoing Rotation Groups (1986-2000)	T.3,T.4, A.T.1, A.T.2, Figure 6
Share Union Workers in Durables Sectors	Calculation analogous to unionization in construction sector. Seen note # for details on which sectors are included in durable manufacturing goods.	Current Population Survey. Monthly Outgoing Rotation Groups (1986-2000)	T.3,T.4, A.T.1, A.T.2
Log Inspection Expenditures per Capita	Expenditures on regulation and inspection of private establishments for the protection of the public or to prevent hazardous conditions, at the MSA level. See * for more details.	Census of Governments (1982,1987,1992,1997)	T.3,T.4, A.T.1, A.T.2
Regional Dummies	We match each with the corresponding Census Region.	U.S. Census Bureau	T.3,T.4, A.T.1, A.T.2

Notes:

* Expenditures on Inspection

Correspond to local expenditures on regulation and inspection of private establishments for the protection of the public or to prevent hazardous conditions, not classified elsewhere under another major function. Examples include the inspection of plans, permits, construction, or installations related to buildings, housing, plumbing, electrical systems, gas, air conditioning, boilers, elevators, electric power plant sites, nuclear facilities, weights and measures, etc.; regulation of financial institutions, taxicabs, public service corporations, insurance companies, private utilities (telephone, electric, etc.), and other corporations; licensing, examination, and regulation of professional occupations, including health-related ones like doctors, nurses, barbers, beauticians, etc.; inspection and regulation or working conditions and occupational hazards; motor vehicle inspection and weighing unless handled by a police agency; regulation and enforcement of liquor laws and sale of alcoholic beverages unless handled by a police department.

The following expenditures are excluded: distinctive license revenue collection activities; regulatory or inspection activities related to food establishments or to environmental health; motor vehicle inspection, liquor law enforcement, and other regulatory type activities of police agencies; regulatory and inspection activities related to other major functions, such as fire inspections, health permits, water permits, and the like.

The variable is reported at the metropolitan area level. The expenditures are reported for all local governments in a county by the *Census of Governments*: 1982, 1987, 1992, and 1997. Values in the years without surveys are obtained by linear interpolation (before 1997) or by using their previous growth trend (after 1997). All local governments within the county area are added together, and the duplicative inter-local amounts are removed. We then sum expenditures for all counties in a MSA using the 1999 county-based definitions from the Census.

‡ Value-to-cost ratio: Metro AHS Data

a. Creating adjusted house values

Two important adjustments to the house values reported in the AHS involved controlling for depreciation on older structures and the fact that owners typically over-estimate their house value. Recall that we need to know if the value of a unit is above construction costs were it to be rebuilt under current specifications (such as current building codes). Thus, we need an adjusted value that corresponds to the price of a newly built unit. It is only adjusted value that is properly comparable with current construction costs for the purposes of obtaining implicit land values. We use only single unit structures from the AHS (construction costs for apartment buildings are rather different). However, these units may be attached or detached.

Goodman and Ittner (1992) report that the typical household reports home values that are 6 percent higher than actual market prices. Thus, we divide reported values by 1.06 to correct for this bias. Restricting ourselves to housing units with reported square footage, we then regress the logarithm of the value per square foot on age and vintage dummies (age effects are identified, as we have repeated time observations of units in the same vintage). The omitted vintage is 1991-1994. We use the coefficients from this regression to inflate the value that would pertain had there been no depreciation (i.e., as if it had been built between 1991-1994). After all the adjustments, the mean adjusted value is 32 percent *bigger* than the unadjusted mean, due to the importance of age and vintage effects.

b. Matching with construction cost data

The Means data reflect average costs for several home sizes and qualities, with and without a basement. The data are reported for 177 cities. We match these cities with their corresponding metropolitan areas in the national and metropolitan AHS, when the match is available. In 95 percent of the cases, there is a one-to-one correspondence of city and metropolitan area. For the rest of MSAs, we use the cost in the main

city. The variation in costs across cities within the same metropolitan area (e.g., Long Beach and Los Angeles) is very small.
We have data on construction costs for 1940, 1950, 1960, 1970, 1979, 1980, 1985, 1987, 1989, 1990, 1991, 1993, 1995, 1997, 1999, and 2000. We use interpolation to estimate the values in the missing years from 1970 to 2000. From 1980 to 2000, the evolution of construction costs is almost linear, so we use linear interpolation for that period. Unfortunately, we only have data for 1970 and 1979 when considering the seventies. Linear interpolation may be too rough, as inflation accelerated only after 1974. Consequently, the approach we take is to calculate the share of the CPI gap between 1970 and 1979 that was covered each year. We then apply that share to the gap between the 1970 and 1979 housing cost indexes.

Finally, we match homes with the corresponding construction costs for its MSA, year, and type of building (i.e., by size and whether there is a basement present). As noted in the text, all cost data are for an economy-quality home based on Means Co.'s specifications.

c. *Metropolitan AHS samples 1998-2001*

We use the recent samples of the metropolitan AHS (which tend to track the major metropolitan areas in the US) to describe the distribution of value/cost ratios. Each MSA is sampled on a different year. The year distribution in the Metro AHS samples (1998-2002) is as follows:

Metro Area	Year Sampled
Baltimore	1998
Birmingham	1998
Boston	1998
Cincinnati	1998
Houston	1998
Minneapolis	1998
Norfolk	1998
Providence	1998
Rochester (NY)	1998
Salt Lake City	1998
San Francisco	1998
Tampa	1998
Washington (DC)	1998
Chicago	1999
Detroit	1999
Los Angeles	1999
Philadelphia	1999
Anaheim	2002
Buffalo	2002
Columbus (OH)	2002
Dallas	2002
Fort Worth	2002
Kansas City	2002
Miami	2002
Milwaukee	2002
Phoenix	2002
Portland (OR)	2002
Riverside	2002
San Diego	2002

Definition of Durable Goods Sectors (CPS)

Manufacturing (Durable Goods)
Lumber and wood products , except furniture
Furniture and fixtures
Stone clay ,glass and concrete product
Primary metals
Fabricated metal
Not specified metal industries
Machinery, except electrical
Electrical Machinery, equipment ,and supplies
Motor vehicles and equipment
Aircrafts and parts
Other transportation equipment
Professional and photographic equipment
Toys, amusements ,and sporting goods
Miscellaneous and not specified manufacturing industries

Additional General Notes

- All dollar values are deflated to 2001 prices using the urban CPI “All items less shelter” index.
- MSA definitions follow the ones provided by the AHS in Table 1, and 1999 MSA/NECMA definitions in Tables 3 and 4.