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Abstract: This paper uses employment and output in high-tech industries, venture capital funding, and the number of dot-com firms per 1000 private workers, at the metropolitan level, to identify their contribution to differences in housing market outcomes. Housing prices in New Economy markets are found to be higher, peakier and more volatile than in old economy markets. Homeownership rates are found to be lower in new economy metro areas while crowding is found to be higher. Although the distribution of housing values, cost, and rents was more equal in New Economy markets, the cause would seem to be differences in metro area income levels, with poorer MSA's having greater inequalities. Regression analysis is used to identify the contribution of traditional supply and demand factors such as job growth, income, residential construction, as well as New Economy indicators, to housing market outcomes. Rather than being fundamentally different, New Economy housing markets are found to be faster and more extreme versions of traditional housing markets.

Keywords: New Economy, housing markets, housing prices, homeownership.

INTRODUCTION

The past 25 years have given rise to what has come to be called the New Economy. The New Economy is less a single thing, and more a process of fast-paced economic evolution with information technology at its core. Among the changes that have either accompanied or been fostered by the rise of the growth of the New Economy are: the rise of high-technology industries, particularly micro-electronics and telecommunications; the increasing globalization of economic activity, including both manufacturing and services; increasing global trade; the globalization of capital and securities markets; the shift from analog to digital communications and information processing; the advent of new forms of retailing and service delivery; an ever-widening revolution in biotechnology; and most recently, the growing use of the Internet for all forms of consumer-to-business and business-to-business transactions.

Driven largely by technological innovation, the rise of the New Economy has also been accompanied by important social, demographic, and political shifts, including increased international migration; changes in the relative political and economic power of corporations, labor unions, and governments; and most ominously, increasing income and wealth inequality both within and across countries.[1]

The transformation of the U.S. economy has been accompanied by a transformation of U.S. housing markets. The most notable transformation has been financial: where housing capital sources were once largely divorced from other capital markets, today, they are almost completely integrated. Yet even as the economy and capital markets have gone global, housing markets have gone local. Particularly with respect to prices and rents, U.S. housing markets differ far more from region to region than they did a generation ago.

To date, the relationships between the transformation of the U.S. economy and U.S. housing markets have not been systematically explored. Although there have been many stories in the popular press about the effect of the high-tech and Internet booms of the late-1990s on certain housing markets, the research community has yet to address the relationship directly. These stories usually concern surging home prices in Silicon Valley,

Manhattan, and Washington, D.C.—all centers of the New Economy—as well as the re-emergence of gentrification in reviving urban cores.

Viewed in context, these stories are not all that unusual. Housing prices and rents have long been known to follow economic activity: rising during periods of job growth, and then moderating or even falling during periods of job decline. Between 1990 and 1993 for example, Los Angles County lost 400,000 jobs, or roughly ten percent of its employment base (California Employment Development Department, 1996). Measured in constant dollars, median home prices during this period declined by nearly twenty percent. Thus, the question is not whether regional housing market outcomes follow economic trends—of course they do. Rather, it is whether relationships between the housing market and the economy are different in New Economy regions than in other types of economies.

There is reason to think they should be. On the demand side, New Economy metropolitan areas are characterized by higher levels of capital investment and liquidity, by higher rates of job turnover, by higher wage and productivity levels, and at least in theory, by increasing income inequality. On the supply side, some notable New Economy regions (such as San Francisco or Washington, D.C.) are also characterized by natural and/or or man-made housing supply constraints. Both sets of characteristics suggest that housing prices and rents should be higher, and more unequally distributed, in New Economy housing markets than elsewhere, as well as potentially more volatile.

The issue is not simply one of prices and rents. After generations of decline, overcrowding in many U.S. housing markets is again on the way up. Whether this is because of a general lack of housing supply, or whether it is because immigrant households are willing, at least temporarily, to tolerate higher levels of crowding than long-time residents remains an open question. Crowding is just one measure of housing welfare. While increasing overall, homeownership rates continue to vary widely between and among metropolitan areas. Particularly for renters, housing cost burdens have also been rising.

This paper seeks to determine whether and how New Economy housing markets differ from their more traditional counterparts. The remainder of this paper is divided into three parts. The first considers how and why New Economy metropolitan areas are different from their more traditional counterparts. It also compares different New Economy metropolitan typologies. The second section explores how and why such differences should transmit themselves into the housing market, as well as presents the results of series of empirical tests comparing housing market outcomes and the degree to which large U.S. metropolitan areas are participating in the New Economy. The third section contains the conclusions and implications for policy which arise from the findings.

IDENTIFYING NEW ECONOMY METROPOLITAN AREAS

Most analysts agree that the rise of information technology has given rise to a new form of industrial organization and outputs. This has been called the New Economy. New Economy industries are typically distinguished from their older counterparts by the newness of their products and services, by their rates of technical and product innovation, and by their use of hardware and software information technology. They are also distinguished by the relative importance of ongoing research and development efforts and by the increasing importance of highly educated technical employees or contractors to the central business function. In addition, the new industries, or the more transformed of the old industries, make more intense use of information in both the end product and in the production supply chain. (Bosworth and Triplett, 2001 among others.) Common examples of new economy industries include semi-conductor manufacturing, computer and computer equipment manufacturing, nanotechnology enterprises, telecommunications, aerospace and defense manufacturing, air transport, certain types of communications and entertainment media, bio-technology including pharmaceuticals, and advanced business and financial services.

Just as important as the emergence of new economy industries has been the increasing use of information technologies and advanced production techniques by traditional industries. Indeed, technically speaking many old economy industries are more advanced than their newer economy counterparts.

Most metropolitan economies include both new and old economy industries. One way to identify the importance of the New Economy in a metropolitan would be to calculate some form of location quotient, comparing local employment or output in various new economy industries with national or even international employment and output in those same industries. Regional economists have long used location quotients to identify industrial clusters and to classify and compare metropolitan economies (Dunn 1971; Perry and Watkins 1977; Noyelle and Stanbach 1984; Markusen, Hall and Glasmeier 1986).

Yet location quotients have their limitations. They are typically derived using economic data organized using the Standard Industrial Classification (SIC) system. Originally developed in the 1940s, and modified several times, the SIC system (or NAICS, as it is now known) is oriented around the production, sale, and distribution of material goods. Despite periodic attempts to update it to better account for service, information, and knowledge-based activities, this system remains strongly anchored in its manufacturing and goods production tradition. Thus, any SIC-based (or NAICS based) classification system is likely to understate the importance of new economy industries.[2]

A second issue is more fundamental. The New Economy consists of more than clusters of technology and knowledge-based industries. Rather, it consists of entirely different business models in which instantaneous information flows between producers or between producers and consumers both substitute and complement more traditional product flows. Thus, the higher-value added associated with the new economy is based on its ability to quickly access and organize, and then re-access and re-organize financial capital, physical capital, labor, market information, and consumer and producer preferences. Amazon.com and EBay, the two companies most frequently cited as the harbingers of the New Economy aren't simply replacements for existing old economy businesses. Rather, they present fundamentally new models for communicating and organizing consumer-producer relationships.[3] And, Amazon.com's SIC code puts it in the retail book sector.

Thus, in addition to being a series of new businesses each with their own products, workers, buildings, capital sources, and management approaches—in short, all the

trappings of the old economy—the New Economy consists of a network of fast-changing relationships between suppliers, producers, consumers. The fact that it is difficult to measure the value of such relationships using traditional and slow-to-change economic transaction data is the why the New Economy resists easy measurement.

Economists and economic geographers have developed a number of systems for identifying the strength of the New Economy in a metropolitan area, based variously on: (i) jobs in research and development activities as a share of firm employment, (ii) high-tech output, (iii) venture capital funding, and (iv) internet business activity. Among the most notable such systems:

R&D Employment. Researchers have long recognized the central role of research and development (R&D) activities in innovative and high-technology economies. A variety of indicators of research and development activity are available at the metropolitan level, using various combinations of three and four digit SIC codes. The most venerable of these is the one developed by Daniel Hecker to identify high-technology industries. (Hecker 1999) Using three-digit SIC data published by the Bureau of Labor Statistics, Hecker identifies high-tech industries as those business establishments in a metropolitan area in which the percentage of R&D employees is above the mean for all industries. (See Chart 1 for a list of the SIC codes.) The strength of the Hecker index is its transparency and ease of construction using commonly available data. Its weakness is that it cannot distinguish between facilities and businesses because it is establishment-based rather than firm-based. A metropolitan area with numerous state-of-the-art computer manufacturing plants (and manufacturing employees) but few research and development facilities will be classified as old-tech, whereas a metropolitan area with multiple R&D facilities but few manufacturing plants will be classified as high-tech. The data for this study was from 1995.[1]

Electronics Industry Employment. A similar classification system was developed by the staff of the American Electronics Association. Based on the assumption that electronics workers are disproportionately employed in high-tech firms, the AEA distinguishes

[1] Robert Bell of BLS kindly provided us with this data at the metropolitan level.

metropolitan areas and states based on the their relative percentages of workers employed in electronics and related industries. (AEA, 2001) The strength of the AEA system is that it is enumerated at the four-digit SIC level. (See Chart 1 for SIC codes) Its weakness of course, is that when it comes to identifying high-tech industries and metropolitan areas, workers in radio manufacturing plants count the same as next generation computer programmers. Data for this effort was for 1998.[2]

Output of R&D Intensive Industries. Ross DeVol of the Milken Institute has developed what he calls a "TechPole" indicator for classifying metropolitan areas that combines traditional employment-based location quotients with actual output levels (DeVol 1999). Based on a more specific set of SIC codes than Hecker's index, and available only for 1998, DeVol's index was used by the U.S. Department of Housing and Urban Development in its recent analysis of the comparative strength of metropolitan economies (US HUD, 2000). (See Chart 1 for SIC codes.)

Dot-Com Businesses. One of the most visible exemplars of the New Economy has been the rise of internet-based businesses, more popularly known as dot-coms. Celebrated—perhaps prematurely, it turns out—as heralds of the New Economy, dot-com businesses established themselves first among the technology and media centers of the West and East Coasts, and then later expanded inland. Because of the speed of the dot-com proliferation, longitudinal and comprehensive information on dot-com employment at the metropolitan level remains sketchy. As a proxy for dot-com activity, Zook (1998) classified metropolitan areas according to their numbers of registered Internet domain names.[4] Covering the years between 1993 and 1998, Zook's data series is normalized by private sector employment to account for differences in metro area size.

Venture Capital Funding is a specialized form of finance supporting small privately owned companies judged to have the potential for fast growth. Although there are many different types of venture capitalists and venture capital deals, most involve exchanging up-front investment capital for equity shares. With the emergence of the modern venture capital system in the late 1970's, the venture business came of age in the 1990s in support

[2] Matt Kazimerski of AEA kindly provided us with this data at the metropolitan level.

of high-tech start-ups, mostly in and around Palo Alto. According to Venture One, a venture capital consulting firm, venture capital investments rose from $6.8 billion in 1995 to $11.3 billion in 1998. As the magnitude of venture capital funding increased, so did the geographic distribution of capital sources and investments. Data on both the number of venture capital transactions and the total dollar amount for this effort is from Venture One for US metro areas from 1995 through 1998.

Table 1 lists the largest MSAs by quartile according to each of the above classification systems as of 1998. (Only MSAs with a population of one million or more were ranked.) The results of these rankings are not particular surprising. With a few minor exceptions, most of the metropolitan areas that ranked highly in one classification system also ranked highly in the others. San Jose and Boston appeared most frequently among the top five MSAs in all five classification systems. Other MSAs that appeared at least twice among the top five were Austin, Dallas, Washington DC, Oakland and Santa Ana /Orange County. When the top quartile are looked at for frequency, Washington DC, Seattle, Denver, Atlanta, San Diego and Los Angeles are added to this list. Within the top quartile, San Jose, Washington DC, Santa Ana/Orange County, Boston appeared the most frequently.

Only a few metropolitan areas appeared only once in the top quartile of all five rankings. Detroit appeared in the top five of the Hecker rankings, principally because of the number of engineers working in the auto industry. Cincinnati, Newark and Milwaukee were also ranked highly under the Hecker system for much the same reason. Miami-Dade appeared in the top quartile of MSAs ranked according to the concentration of dot-com firms, but was further down the list in the other rankings. Similarly, Phoenix scored highly on the Milkin Techpole Index, but lagged in the other rankings.

In addition to rankings, Table 1 lists actual index values, and they too are instructive. Within just the top quartile of MSAs ranked using the Hecker index, the index value for the top MSA (San Jose) is nearly four times that of the lowest- ranked MSA (Milwaukee). Among the top-quartile of MSAs, ranked according to the Milkin Techpole Index, the value of the top-ranked MSA (San Jose again) is twelve times that of the

lowest ranked MSA (Orange County). The gap within the top-quartile between the top and bottom venture capital MSAs (San Jose and Atlanta) is even greater still. Whether in terms of R&D employment, high-tech output, dot-com businesses, or venture capital funding, some MSAs are leaders, others are laggards, and a few are super-leaders**.**

For the analysis in this paper, we selected the number of dot-com domains in a metropolitan region because it is an indicator of two important and overlapping aspects of the New Economy: the willingness and speed at which businesses adopt new technology and opportunities. First the registration of a dot-com domain name suggests that the owner intends to use the Internet for something beyond simple email or surfing. The possession of a domain name allows for the creation of a professional-looking website that can be used for everything from posting "brochureware" to establishing an e-commerce center. Second, the timing of when a domain name is registered indicates the awareness of the owner of the Internet as a means of communications. In 1994 very few people even knew that the Internet let along domain names existed. Early and large concentrations of domain names in regions suggest that the area was more attuned to the emergence of the commercial Internet, one of the most visible manifestations of the New Economy. In addition, this indicator is the most multi-faceted. Like the Hecker and AEA indexes, it incorporates aspects of industrial structure. Like the R&D funding and venture capital measures, it also captures aspects of the technological and entrepreneurial nature of the New Economy. Last, but certainly not least, it is the New Economy measure most highly correlated with the other New Economy measures (see Table 2).

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Maps 1 and 2 compare median existing home prices by MSA as of 1998 with the number of dot-com firms per worker, also by MSA. As any resident of San Jose, San Francisco, Seattle, Austin, Washington, D.C, or Boston can attest, the two maps look almost identical.

Yet seeing is not always believing. Not only are housing and industrial markets extremely complex, they rarely operate in perfect tandem. Just because a particular metropolitan

area's industrial structure is oriented toward high technology or other new economy industries does not mean that its land or housing market should operate any differently. In the main, housing outcomes should reflect market fundamentals: the closer the balance between housing supply and demand, and the more competitive the market, the lower the price of housing. Similarly, land prices will tend to be lower in markets in which supplies are plentiful, and higher in markets in which supplies are dear.

Even so, forces and factors can overlap between markets. On the demand side, one would expect the greater capital availability and liquidity associated with New Economy markets to quickly work its way through to higher average housing prices and rents. New economy housing prices and rents should also be higher to the extent that labor productivity and wages are higher in New Economy regions. When and where new economy businesses disproportionately compensate their workers with stock options or other liquid capital assets, there should be a positive wealth effect on housing prices in new economy regions. The flip-side of the higher wage levels associated with New Economy markets is that the income distribution may also be more unequal (Reich 1991).

On the supply side, Kotkin (2000) and others such as Richard Florida (Florida, 2001) have argued that New Economy workers place a higher value than old economy workers on place-based community and environmental quality-of-life attributes. To the extent that continued development is seen as degrading those attributes, there may be strong pressures to limit further growth by capping new construction or by placing threatened areas off limits to development. Alternately, new development may be required to "pay its own way" through increased impact fees and exactions. The housing market's response to diminished construction opportunities and higher costs is almost certain to be higher prices and rents. (Katz & Rosen 1987; Dowell & Landis 1986, Fischel 1989) There is a second supply side reason why land and housing costs may be higher in new economy regions. To the extent that new economy work spaces consist of low-rise suburban office buildings rather than center-city high rises, the workplace footprint of the new economy will also tend to be bigger, pushing up suburban land prices and leaving less land available for housing.

To the extent that new economy metropolitan areas are more demographically and socially diverse, local housing markets may also be more diverse. Housing types and neighborhoods may be more distinct, prices and rents may vary more, and housing welfare levels (e.g. housing cost burdens and overcrowding) may vary more widely. In short, the housing market may be characterized by a greater number of more varied submarkets.

Explaining Differential Housing Market Outcomes—A Review of the Literature

Differences in metropolitan housing market outcomes have been documented by a number of authors (Harvard Joint Center for Housing, yearly; Hughes 1996; Calhoun, Chinloy & Megbolugbe 1995; Abraham & Hendershott, 1996). These studies found that the enormous run-up in housing prices between 1970 to 1980 was strongest in the western region of the United States, with a nominal increase in value of almost twice that of the other regions. The bi-coastal economic boom of the 1980s resulted in further price increases—and in some places, mostly speculative price increases—among the major metropolitan areas of the Northeast, Mid-Atlantic, and West regions (Hughes, 1996). The housing market impacts of the recession of 1990-1992 were also mostly bi-coastal. Abraham and Hendershott (see above), estimate that real housing prices rose 50% more in coastal markets than in other markets between 1984 to 1990, and fell by 15% more between 1990 and 1993. Among Northeastern cities, real prices rose by 92% from 1983 to 1988, and declined by 25% through 1993.

Two other studies pursue the theme of geographically clustered housing markets with respect to sales price and or value. Abraham, Goetzmann, and Wachter, (1994) applied a clustering algorithm, K-means, to an index of housing price returns in 30 metropolitan areas from 1977 to 1992, and found persistent and meaningful differences between west coast, east coast and middle America MSAs. In a similar vein, Dielemann, Clark & Duerloo (2000), used rent and price data from the 1985 and 1995 American Housing Survey to classify the largest 27 MSAs into three groups: (i) East and west coast MSAs characterized by high and volatile price levels; (ii) Northeast and Northwestern MSAs,

characterized by somewhat higher but stable price levels; and, (iii) Midwest and Southern MSAs, characterized by lower and stable price levels.

Recent research regarding spatial and temporal variations in homeownership rates have tended to focus on demographic factors (Hughes 1996; Gyourko 1998) rather than economic ones. Both authors conclude that the recent upswing in homeownership rates has occurred because of the aging of the population. In related work, Myers et al. (Myers, Megbolugbe and Lee, 1998) use cohort analysis to explore homeownership rates among immigrants, and conclude that aging and duration of US residence are important factors. In older studies (Rosen, 1967 among others), models explaining homeownership at the national level over time included such macro economic indicators such as interest rates. None of the research to date has incorporated the industrial base of an area as a factor influencing the rate of homeownership.

A number of authors have tried to isolate the causes of regional differences. With a few exceptions, most have concluded that differences in housing market outcomes have their origin on the demand side, with metropolitan housing price levels tracking most closely with income levels. Green (this volume) finds that household capital asset levels affect housing consumption levels and also contribute to escalating prices, especially at the upper end of the housing market.

On the supply side, Potepan (1996) using pooled cross-sectional and time-series data from the American Housing Survey, also identified differences in construction costs as contributing to inter-metropolitan housing price differentials. Other researchers, most notably Malpezzi (1996) and Malpezzi, Chun, and Green (1998) have focused on housing price effects of supply constraints such as regulation. In a brief analysis of the largest 60 metropolitan areas, Landis and Deng (2000) found that the lower the level of new housing construction relative to job growth from 1995 to 1999, the larger the increase in sales prices. This was particularly the case among coastal metropolitan areas like San Jose, Washington DC, Los Angeles, Boston, Oakland and Orange County.

There is no research to our knowledge which explicitly incorporates regional industrial structure, that is, the "restructured" economic base of an area, to housing outcomes.

Dielemann, et. al. (cited above) alludes to these factors but does not explicitly incorporate them into the analysis. This paper is an attempt to explain housing outcomes by the industrial structure of a metropolitan area, specifically, the degree to which the local economy is part of the "New Economy."

Housing Outcomes and the New Economy: Comparing Means

To more fully explore the impacts of the New Economy on housing markets, we focused on the 47 largest U.S. metropolitan areas having a 1998 population of a million or more. The core data used for this effort comes from the State of the Nation's Cities (SONC) database maintained by Rutgers University. This database combines metropolitan area Census data from 1970 through 1996, and MSA-level data compiled by the Bureau of Economic Research into the Regional Economic Information System (REIS) through 1997. The SONC/REIS database was updated by the authors to 1998. Additional MSA data was added as noted. The time period of the study was restricted for to the 1993-1998 period, principally for reasons of data availability. Although many analysts believe that the seed of the New Economy were first sown in the 1970, the productivity benefits of that transformation were not realized until the early 1990s.

Three types of housing outcome variables are of interest: those measuring housing market transactions and activity levels, principally prices; those measuring housing welfare; and, those measuring the intra-MSA distribution of housing prices and costs.

- Transactions and Activity Measures: Three sets of housing market transaction measures were considered: (i) *MSA median home prices*, as compiled by the National Association of Realtor (NAR), and adjusted for inflation;[5] (ii) *the rate of increase or decrease in the MSA median home prices*, also generated from NAR data; and, (iii) *home price volatility*, as indicated by the coefficient of variation of real home prices between 1993 and 2000.[6]

- Housing Welfare Measures: Of the five measures usually used to measure housing welfare levels,[7] we selected three for analysis: (i) *Metropolitan homeownership rates* covering the years between 1993 and 1998, as obtained from the U.S. Department of

Housing and Urban Development; (ii) *Average MSA housing cost burdens*, measured as the ratio of the median MSA home price to MSA per capita income, for the years 1993 to 1998; (iii) *Overcrowding***,** measured as the average number of persons per room by MSA for the years 1985 and 1995, as compiled from the American Housing Survey.

- Distributional Measures: To explore the effects of the New Economy on the distribution of housing outcomes within MSAs, we used AHS data to generate housing value, cost, and rent *Gini coefficients* for 1985 and 1995. Gini coefficients measure the deviation from a perfectly equitable distribution, defined as occurring when a particular good, or item, is possessed by each member of the population in equal proportions. Gini coefficients vary from zero to one. Larger Gini coefficients, closer to 1, indicate greater inequality; smaller Gini coefficients, closer to 0, indicate less inequality.

Selection of a Single New Economy Indicator: As indicated above, dot.coms per 1000 private workers in a metropolitan area was selected as the indicator of choice to represent the New Economy. Housing markets were arrayed into quartiles according to the number of dot.com domain names per 1000 private workers.

Price Comparisons. Table 3 summarizes the means of the various outcome variables for the 47 largest MSAs as well as by dot-com quartile. At first glance, and without accounting for other factors, median home prices look to be significantly higher in New Economy housing markets than in other markets. According to the National Association of Realtors, the median home price among the top quartile New Economy metropolitan areas in 2000 was $235,000, versus only $128,600 in the second, third, and fourth New Economy quartiles. Housing prices also rose faster in New Economy markets: real home prices in the top dot-com quartile increased 23.7% between 1993 and 2000, versus only 13% in the second, third, and bottom quartiles. Price volatility was also greater in New Economy markets. Measured as coefficient of variation of home prices between 1993 and 2000, home prices were 25% more volatile in the top quartile of New Economy markets than in the second, third, or bottom quartiles.

Welfare Comparisons. What of housing welfare? Among MSAs with a population of a million or more, homeownership increased from 60.1% in 1993 to 63.7% in 1998 (HUD 1999). Homeownership rates in the top quartile New Economy MSAs were lower in 1993, lower in 1998, and increased less than in other MSAs. Among the top quartile New Economy MSAs, the 1998 homeownership rate was only 56.9%, compared to 66% in the second, third, and fourth New Economy quartiles. This difference is not too surprising given previous findings that housing prices are also systematically higher in New Economy markets. **JOHN?????**

The ratio of housing price-to-family income is a reasonable, albeit not perfect, surrogate for burden and affordability.[8] Nationwide, housing price-to-income ratios fell during the 1990s—the result of rising family incomes and plentiful construction. Among MSAs with a population of a million or more, the average ratio of housing prices to income fell from 4.9 in 1993 to 4.7 in 1998 (U.S.HUD, 2000). The decline was largest among New Economy markets, although housing prices in 1998 were still much higher compared to incomes in New Economy markets than elsewhere. Among the top quartile New Economy MSAs, median home prices in 1998 were nearly six times as large as median incomes, compared to about four times as large in the second, third, and fourth New Economy quartiles.

A housing unit is considered overcrowded if the ratio of persons to rooms exceeds 1.0. Among MSAs with a population of a million or more, the average number of persons-per-room in 1995 was .48. At .52, the average number of persons-per-room among in New Economy MSAs was slightly higher than for all large MSAs. Generally speaking, the more traditional the economic base, the less the degree of overcrowding.

Distributional Comparisons. Average and median housing outcomes are of little interest to the wealthy or the poor. Poor households are no more able to afford the median-priced home than the most expensive home. Likewise, for a wealthy household, the median-priced home would typically hold about the same interest as the least expensive home. For most households, it is the distribution of housing prices, rents and burdens that matters, not the average or median.

Among MSAs with a population of a million or more, the average 1995 *housing value* Gini coefficient was .302.[9] At .270, the average housing value Gini coefficient among New Economy MSAs was considerably lower, indicating that the distribution of values was more equal in New Economy MSAs than in more traditional economies—at least as of 1995.[10] Indeed, among the 47 MSAs analyzed, housing values were the most unequal among the bottom quartile of New Economy MSAs.

The American Housing Survey also asks detailed questions about housing cost, defined as a household's total monthly outlay for mortgage payments, insurance, and utilities.[11] Among MSAs with a population of a million or more, the average 1995 monthly housing cost Gini coefficient was .344.[12] Unlike the 1995 housing value Gini, the *housing cost* Gini did not vary by New Economy quartile. The 1995 distribution of housing costs was about the same in New Economy and Old Economy MSAs alike.

What of rents and renters? Are renters in New Economy housing markets facing a more or less equal distribution of rents than their counterparts in traditional economy markets? Because rents are less sensitive to length of tenure and can change by contract, rent distributions provide a more accurate assessment of current housing market conditions than either housing value or housing cost distributions. Among MSAs with a population of a million or more, the average 1995 *monthly rent* Gini coefficient was .212.[13] Similar to the case of housing values, rent distributions were far more equal among New Economy MSAs than among more traditional economies. The 1995 Gini coefficient for rents in the top New Economy quartile was only .188, versus a much higher .237 for the bottom New Economy quartile. Readers should remember that Gini coefficients measure distributions, not magnitudes. This means that housing prices can be as evenly distributed—or for that matter, as unevenly distributed—within expensive housing markets as inexpensive ones. Put another way, both high and low cost housing markets can have a similar Gini coefficient.

Regression Results

How much of the difference in housing market outcomes can reasonably be attributed to the New Economy versus other factors? To find out, we used regression analysis to

compare the various housing outcome measures summarized above to several MSA-level measures of housing supply and demand, as well as to indicators of the New Economy. As noted previously, our principal measure of the New Economy is the number of dot-com domains in an area by 1000 private workers.

Residential permits were used as the principal indicator of supply. To better account for metropolitan size differences, we divided the total number of new residential building permits issued between 1993 and 1998 (as obtained from the Census Bureau) by the change in the number of jobs during the same period. Labeled SUPPLY-FLEX, this measure is a sort of political elasticity of supply: all else being equal, the more responsive the housing construction sector is to job growth, the lower the expected median home price, or rate of price increase.

To keep things simple, amounts and rates of metropolitan job growth between 1993 and 1998, and per capita income in 1993—both obtained from the Bureau of Labor Statistics—were used as principle measures of demand. All else being equal, we would expect median housing prices to be higher in wealthier metropolitan areas—that is, those which started the decade with higher per capita incomes.

Four regression models were tested for each outcome measure: the first without any New Economy variables; a second model including the number of dot-com firms per 1000 total jobs; a third model one including a dummy variable indicating whether the metropolitan areas was in the top quartile of dot-com workers per thousand jobs, and a fourth model in which the top dot-com quartile dummy variable was allowed to interact with measures of housing supply and demand.

Housing Price Regressions. The price model results are reported in Table 4. Among the 41 MSA observations, the three demand and supply variables alone explained 67% of the variation in Year 2000 median home prices.[14] Per capita income, as expected, had a strongly positive influence on median home prices: for every $1,000 difference in 1993 per capita incomes between metropolitan areas, median housing prices in the year 2000 were $12,000 higher. Ease of construction—measured as the ratio of building permits to job growth—had the expected negative effect: the more new homes constructed per

additional job, the lower the MSA median home price in the Year 2000. After accounting for both income and supply effects, MSA job growth rates were not correlated with housing price levels.

Adding the number of dot-com domain names per 1000 jobs in 1998 (Model Type II) significantly improved the overall model fit, boosting the r-squared from .67 to .82. The New Economy effect was both large and significant: For every additional dot-com domain name per thousand workers, the MSA median home price in the year 2000 increased by $10,000. And although their relative contributions declined, the signs and significance levels of the supply and demand variables did not change. Controlling for the contributions of housing supply and demand factors, median home prices in the top New Economy MSA quartile (Model Type III) were $44,000 higher than in other MSAs.

The New Economy clearly supercharges housing prices but how does it affect housing market dynamics? That is, are supply-demand-price dynamics fundamentally different in New Economy markets than in other markets? To find out, we multiplied the top New Economy quartile dummy variable by 1993 MSA per capita income, and by the ratio of residential permits to job change. The results are presented in the final column of Table 4 as Model Type IV. The estimated coefficients of these interaction-effect variables were not statistically significant. Coefficient magnitudes and significance levels were otherwise significant to those of Model Type II. This result suggests that at lest when it comes to price levels, the dynamics of New Economy housing markets are more extreme than those of traditional economies, but not fundamentally different.

Housing Price Changes and Volatility. Houses are clearly more expensive in New Economy markets than elsewhere, but to what extent have they also appreciated more? And what of price volatility? Do home prices typically fluctuate more year-to-year in New Economy markets than elsewhere? To answer these two questions, we duplicated the previous housing price analysis, changing the dependent variable from median sales price, first, to percentage change in sales price; and second, to the sales price coefficient of variation. Both measures span the years between 1993 and 2000. Basic economic theory would suggest that price appreciation rates should be positively correlated with

income levels, and negatively correlated with SUPPLY-FLEX, the ratio of residential building permits to job growth. For much the same reason, we would also expect SUPPLY-FLEX to be negatively correlated with price volatility. Median 1993 home sales prices were included in both model sets to account for scale effects. Since job growth is a major driver of housing demand, the rate of job growth between 1993 and 1998 (%JOB-CHNG) was also included in the appreciation model.

Table 5 presents the results of both the appreciation and volatility models. Among the 41 MSA observations, the SUPPLY-FLEX and %JOB-CHNG variables explained 36% of the variation in 1993-98 median home price appreciation rates. The coefficients of both variables were of the expected signs: positive in the case of %JOB-CHNG, and negative SUPPLY-FLEX. Neither the initial housing price level or per capita income coefficients were statistically significant.

Adding the number of dot-com workers per 1000 jobs in 1998 (Model Type II) improved the overall model fit, boosting the r-squared from .36 to .45. **(TO BE ADDED)**

Housing Welfare Results. Has the growth of the New Economy led to improving or declining housing conditions? Housing prices are a good indicator of the shifting market balance between supply and demand, but, by themselves, do little to measure economic welfare—that is, whether housing conditions are improving or declining. In theory, changes in housing welfare should track changes in incomes and housing prices. When housing prices and rents rise relative to incomes, households must either pay more for housing (i.e., increased burdens and/or travel home-to-work travel times), or double-up (i.e. increased crowding), or hold-off becoming homeowners, or some combination of the three.

In practice, there is usually a considerable time lag between changes in relative housing prices and aggregate housing welfare outcomes. With fewer than twenty percent of households actively involved as buyers or sellers of housing services in any given year, there is considerable inertia in most housing markets. Especially on the ownership side, average housing cost burdens, homeownership rates, and crowding levels are as much the result of housing decisions made in previous years as they are the result of current

housing market conditions. Still, because everything in the New Economy seems to happen faster, it is possible that housing welfare also respond faster to changing housing market and economic conditions in New Economy markets.

We first consider homeownership. On the one hand, to the extent that home prices in New Economy markets are typically higher than elsewhere, we might expect homeownership rates to be lower. On the other hand, the greater liquidity and possibility of wealth creation in New Economy markets suggest that over the long term, they might have a greater potential for homeownership since wealth and income may be higher also. To find out how much of the difference in MSA-level homeownership rates is associated with the New Economy, we used regression analysis to compare 1998 homeownership rates among the 44 largest metropolitan areas with 1993 homeownership rates. We also used various measures of housing demand and supply and two measures of the New Economy: the number of dot-com domain names per 1000 jobs; and a dummy variable indicating whether an MSA was in the top quartile of the number of dot-com firms per thousand jobs. The results are presented in the top block of Table 6.

Among the 44 MSA observations, initial homeownership rates and the two demand and supply measures (EMP98/POP98, the ratio of 1998 employment to population; and SUPPLY-FLEX, the ratio of permits to job growth) alone explained 68% of the variation in 1998 homeownership rates. The coefficients of all three independent variables were statistically significant. Adding the number of dot-com domain names per 1000 jobs (Model Type II) improved the overall model fit, boosting the r-squared to .73, but reduced the significance level of the SUPPLY-FLEX variable below the .10 probability threshold. As in previous models, the New Economy effect was both large and significant: For every additional dot-com firm per thousand workers, the MSA median homeownership rate declined by about half a percentage point between 1993 and 1998. Among the top quartile of New Economy MSAs (Model Type III), 1998 homeownership rates were nearly three and a half percent lower in 1998 than in 1993. Last, the results of the Type IV model—in which the top quartile New Economy dummy variable is allowed to interact with the supply and demand variables—indicate that while 1998 homeownership rates were systematically lower in New Economy markets, the

relationships between local supply and demand factors and homeownership rates are no different in New Economy markets than elsewhere.

What of the relationship between the New Economy and housing burdens? As noted previously, among MSAs with a population of a million or more, the ratio of median housing price to median income fell during the 1990s—the result of both rising family incomes and plentiful construction. And although the decline was greatest among New Economy markets, housing prices in 1998 were still much higher in those markets than elsewhere. Digging deeper, we use regression analysis to compare changes in housing price-to-income ratios between New and Old Economy MSAs, controlling for employment as a measure of demand, and the ratio of new construction to employment growth as a measure of supply. The results are presented in the middle block of Table 6.

Among the 43 MSA observations for which data were available, the initial 1993 price-to-income ratio and the two demand and supply measures (EMP98/POP98, the ratio of 1998 employment to population; and SUPPLY-FLEX, the ratio of permits to job growth) explained 88% of the variation in the later 1998 price-to-income ratio. The coefficients of all three independent variables were of the expected signs, but only two, the initial ratio (PRICE93/INCOME93) and SUPPLY-FLEX, were statistically significant. As with the results of previous models, there is a consistent and strongly negative relationship between new construction and burden. To those who argue that new construction is not at least a partial antidote to the problem of too-high housing prices, the evidence strongly suggests otherwise.

Adding the number of dot-com firms per 1000 jobs (Model Type II) does little to improve the overall model fit, nor change the contributions of supply and demand. Similarly, controlling for supply and demand, housing price-to-income ratios in 1998 were no higher among the top quartile of New Economy MSAs than among other MSAs (Model Type III).

While the two New Economy variables are not themselves statistically significant, the interactions between the New Economy dummy variable and supply and demand terms are. Controlling for other factors, the 1998 ratio of housing prices to incomes was

consistently smaller—indicating housing was relatively more affordable—in New Economy markets with greater household labor force participation (as measured by the ratio of jobs-to-population). On the supply side, housing was slightly less affordable in New Economy markets with higher levels of new construction. Both effects were slight. What these results suggest is that, controlling for other factors, New Economy housing markets are very slightly more elastic on the demand side and inelastic on the supply side than traditional housing.

One way the households respond to the higher housing prices of New Economy markets is to crowd-up. To further investigate the relationship between the New Economy and overcrowding, we used regression analysis to compare the number of persons per room in 1985 to the same ratio in 1995. The results are presented in the bottom block of Table 6. By themselves, SUPPLY-FLEX and the housing price-to-income ratio explain only 15% of the change in crowding between 1985 and 1995. Since crowding is mostly a function of immigration, this result is not really surprising. What is more surprising is that the SUPPLY-FLEX variable is not statistically significant, suggesting that crowding—at least when measured in terms of persons per room—is less a matter of supply than demand.

Adding the number of dot-com firms per 1000 jobs (Model Type II) substantially improved the overall model fit, boosting its r-squared from .15 to .25. For every additional dot-com firm per 1000 workers, the ratio of persons to rooms increased by about 10 percent, evaluated at the mean. This is not say that dot-com firms cause overcrowding. It is to say that the housing stock in New Economy MSAs is consistently more crowded than in traditional economy MSAs. This interpretation is confirmed by the results of the Type III model, which includes a dummy variable indicating whether or not a particular MSA is in the top quartile when ranked according to the number of dot-com firms per thousand jobs.

***Equality & Distributional Measures*.** Metropolitan housing markets by their very nature are highly segmented—by location, structure type and age, tenure, and of course, price. Controlling for other factors, are New Economy housing markets more or less segmented

by housing price and rent than other metropolitan housing markets? To find out, we used regression analysis to compare a series of housing value, cost, value and rent Gini coefficients across 44 New and Old Economy MSAs, holding constant various supply and demand measures. As noted previously, separate price, value, and rent Gini coefficients were constructed for 1985 and 1995 using data from the American Housing Survey. Gini coefficients vary between 0 and 1, and higher Gini values indicate greater inequality.

Regression results comparing 1995 housing value Gini coefficients with indicators of housing supply and demand are presented in the top block of Table 7. Also included is the housing price Gini coefficient for 1985. By themselves, the demand and supply measures—1985 per capita income, the rate of job change between 1985 and 1995, and the SUPPLY-FLEX variable—together with the 1985 housing value Gini coefficient—explained 77 percent of the variation in the 1995 housing value Ginis. The estimated coefficients for the 1985 housing value Ginis and per capita income were statistically significant, however the SUPPLY-FLEX and job change variables were not. These results suggest that at the MSA level, it is income that most affects the distribution of housing values, not job growth or housing construction.

Adding the different New Economy measures did little to improve the fit of the model or change the contribution of the other independent variables. Simply put, while housing values as of 1995 may have been somewhat more equally distributed in New Economy MSAs than elsewhere, they did not grow proportionately more equal between 1985 and 1995. In fact, it should be noted that overall, gini values increased from 1985 to 1995 for all housing cost indicators.

Likewise, controlling for other factors (including the 1985 distribution of housing costs), as of 1995, there was no statistically significant difference in the distribution of housing costs among New and Old Economy housing markets (see the middle block of table 7). The intra-MSA distribution of housing costs is affected, however by income and job growth: all else being equal, the distribution of housing costs in 1995 was slightly more equal in MSAs that were either wealthier or adding jobs at a faster rate.

Turning to rents, the story is much the same. The intra-metropolitan distribution of rents in 1995 closely followed the rent distribution in 1985, and was also slightly affected by income levels. Interestingly, higher income levels as of 1985 were associated with less rent inequality in 1995, not more. There are several reasons why this might be the case, the most likely being rent truncation on both ends of the rent spectrum. Neither the rate of job growth, nor relative housing supplies, nor the presence of dot-com firms was associated with the 1995 distribution of apartment rents.

Caveats

These results are subject to numerous caveats. They are based on analysis of large MSAs and may not apply smaller ones. In trying to avoid obvious problems of endogeneity—by insuring that the independent variable precede the dependent ones—we have overlooked possible simultaneity. Because of various data limitations, not all data series are available for exactly the same periods, and the periods examined may not reflect the true start of the New Economy. We would have liked to have shown the changes from the top of the business cycle in 1989 to 1999, but again, data availability prevented this. Estimates of housing values are likely biased due to self-reporting. The housing welfare and distribution models consider total housing market outcomes, rather than outcomes at the margin, as is more appropriate. Residential permits are not disaggregated between the construction of owner-occupied and rental units. Per capita incomes are a less appropriate measure of housing demand than household income. These caveats notwithstanding, all the model results point in the same general direction: Rather than being radically transformed, New Economy housing markets are instead, speeded-up versions of Old Economy housing markets.

CONCLUSIONS and IMPLICATIONS

Summary of Findings

Anyone trying to sell a home or rent-out an apartment in San Francisco, San Mateo, or Santa Clara County in the summer of 2000 felt truly blessed. Rents and home prices at most locations were rising at annual rates exceeding 20%. Apartment vacancy rates were

less than one percent. Homebuilders were conducting lotteries to choose buyers. Houses typically sold for 20% or more above asking prices, often with multiple bidders.

There were two ways to interpret these trends. The first was to blame it on the New Economy in general and dot-comers in particular. This view, championed by the popular media, associated rising housing prices, skyrocketing rents, and gentrifying neighborhoods with out-of-control dot-comer salaries and stock options. Newspaper stories delighted in chronicling how newly-minted Internet millionaires were destroying old neighborhoods by buying up older homes, tearing them down, and then replacing them with out-of-scale "monster" homes. The implication was that while the New Economy might be good for businesses and young dot-comers, it was most certainly not good for housing.

A less flamboyant interpretation of the situation pointed to a long-standing and worsening imbalance between supply and demand as the source of the region's housing problems. Rather than re-making the Bay Area housing market, for example, into something new, the New Economy had instead, over-stressed a housing market whose fundamentals were out of balance.

The results of this paper suggest that the while there are significant differences between housing outcomes in New and Old Economy markets, the structure and logic of these markets have not changed:

- Housing prices in New Economy markets are higher, peakier, and more volatile than in their more traditional counterparts. However, this is principally due to higher income levels, higher rates of job growth, and lower levels of housing production—and only partly due to the industrial base.

- Homeownership rates in 1998 were lower among New Economy MSAs than elsewhere, but they were also lower five years earlier, before the Internet boom began. The dot-com explosion may have exacerbated problems of housing affordability and led to reduced rates of homeownership in certain areas, but it was not the root cause of these problems.

- Whether New or Old, the type of metropolitan economy had little effect on the relationship between per capita income levels and housing prices. Built into the operation of all housing markets is a mortgage underwriting mechanism that prevents housing prices from getting too far ahead of incomes.

- Housing in New Economy MSAs was generally more crowded than elsewhere. This is not to say, however, that the New Economy causes crowding. Instead, the higher number of persons per room in New Economy markets, all else being equal, is probably due to the concentrated presence in New Economy MSAs of international immigrants, many of whom are used to denser residency patterns.

- The New Economy does not seem to be directly associated with higher or rising levels of housing inequality within MSAs. Rather, the principal source of housing inequality, as measured using Gini coefficients, would seem to be differences in income levels between MSA's. The lower the income level in the metropolitan area, the greater the degree of value, rent, and housing cost inequality.

In sum, New Economy housing markets are different. They are prone to higher home prices, and to a certain extent, greater over-crowding. These differences notwithstanding, the ways in which New Economy housing markets operate—and the primacy of the relationships between supply and demand in shaping housing market outcomes—are not fundamentally different. Rising incomes and employment have much the same effect on housing prices, homeownership rates, over-crowding and the intra-metropolitan distribution of housing costs and rents in New Economy MSAs as in Old Economy MSAs. Likewise, the positive effects of increased housing production on homeownership rates and housing affordability are much the same in Old Economy markets as in New Economy ones.

Conclusions

Three major conclusions stand out from this research. The first is that metropolitan industrial structure does indeed affect housing market outcomes. (Until now, the link between industrial structure and housing markets has been implicit rather than explicit.) .

All else being equal, homes in New Economy MSAs are likely to be more expensive and more crowded than homes in Old Economy MSAs. Homeownership appears to be more difficult to attain. The data do not reveal why this should be the case. We suspect it is because housing markets by their very nature are slower to adjust to changes in demand than labor and product markets: whereas employees can be added or laid-off, and production can be ramped up or down the next day, it typically takes between six months and two years (depending on the location) to construct a new home.

Second, metropolitan industrial structure does not appear to affect the distribution of outcomes within housing markets. The distribution of housing values, housing costs, and rents are neither more equal nor more unequal in New Economy MSAs than in Old Economy MSAs. Rather than industrial structure, it would seem to be income that determines the intra-market distribution of housing outcomes, with higher per capita incomes associated with a more equal distribution of housing, values, costs, and rents. While this result flies in the face of the literature on wage structure at the MSA level, we nonetheless believe it to be valid.

Third, supply matters. This research concludes that the more responsive the homebuilding industry and permitting process are to increases in MSA employment, the lower the median price of housing, the rate of price appreciation and housing price burden, and the higher the rate of homeownership. Though predicted by theory, and thus not totally unexpected, it is reassuring to find out that with all their idiosyncrasies, housing markets still function the way they are supposed to,

Policy Implications

What, if any implications does this analysis have for housing policy and for housing policy-makers? Federal "on-budget" housing policies have long tried to balance the need for programmatic commonality across metropolitan housing markets with the recognition that housing markets differ substantially from region to region. The result of this balance is that there are broad national programs but that their triggers, standards, and subsidies vary with local needs and price levels. FHA insurance eligibility levels, for example, vary geographically with housing price levels, as do Section 8 Fair Market

Rents. With the enactment of the HOME program in 1990, and by increasing the portability of the Section 8 vouchers, federal housing policy has moved further toward encouraging local flexibility. However, "off-budget" housing policy, principally the interest and property tax deductions available to homeowners have never acknowledged regional differences, and indeed, may be exacerbating them.

Maintaining the fine balance between programmatic commonality and local flexibility in the on-budget programs, will, this analysis suggests, become even more difficult in the future. Two trends seem to be pushing metropolitan housing markets in different directions. The first is metropolitan industrial structure. As this analysis indicates, metropolitan areas with hotter and more volatile economies also tend to have hotter and more volatile housing markets. Not coincidentally, they also tend to be less responsive to homeownership programs. To be effective in such markets, federal programs will need to become more flexible and responsive to rapid changes in local housing market conditions—that is, to become "hotter." For example, allowing FHA ceilings and Section 8 FMRs to more quickly adjust to changes in local price and rent levels would help poor and moderate-income households keep pace with rapid economic changes.

The other trend pushing metropolitan housing markets in different directions is the increasing popularity of supply constraints. Whether explicit, as in the case of urban growth boundaries, growth controls and low density zoning, or implicit, as occurs when elected officials give in to NIMBYism, supply constraints significantly inflate the cost and price of housing. High housing costs, in turn, increase the number of households needing subsidies and the amount of subsidy needed. New Economy MSAs are not the only metropolitan areas to embrace supply constraints, but they have certainly been among the most active. As this research reveals, if supply matters anywhere, it is in fast-growing, New Economy MSAs.

The combination of these two trends is especially problematic. In the absence of adequate housing production, federal policies that are *too* responsive to rising metropolitan housing costs become a sort of reward for NIMByism. Several times over the last fifty years—most recently, in 1991, with publication of the report by the Advisory Commission on

Regulatory barriers to Affordable Housing—federal policy makers have looked for creative and appropriate ways to minimize the housing cost effects of locally-generated supply constraints. They have yet to be successful. On the other hand, subsidy programs are not responsive enough to rising housing costs doom increased numbers of low, moderate-, and middle-income households to ever-increasing cost burdens.

This analysis also adds to the growing body of work questioning the efficacy of the federal income tax mortgage interest deduction. On the one hand, the mortgage interest deduction clearly makes the higher prices and burdens common to New Economy markets more bearable, especially for homeowners. On the other hand, the availability of open-ended tax breaks in high-liquidity/supply constrained markets—in addition to being regressive—adds to the speculative pressures and price volatility which characterize such markets.

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[1] These shifts have been widely documented, in the pages of the Economist, as well through the yearly Census rports and special studies.

[2] The "New Growth Theory" economists, such as Romer, Lucas, Grossmand and Jaffee, are working to develop a theoretical and empirical structure to measure and estimate how investment decisions and economic institutions affect the production of new technology. This may help.

[3] [3] It should be noted, however, that Ebay charges a commission for each transaction—an "old economy" method which has made it possible for it to survive the shakeout in dotcom startups.

[4] The data was developed by using an Internet utility called whosis, which returns the registration information for domain names that were then coded to a metropolitan area according to registration zipcode. Although data is available after 1998, after that time the number of domain names increased again exponentially but not just for dot.com businesses, but for all types of personal and business endeavors. This makes it less useful as an indicator of dot.com businesses and more indicative of the use of the Internet by a large variety of businesses in both the old and new economy.

[5] Unfortunately for this effort, the NAR does not distinguish between the several PMSA's within San Francisco Bay Area. We used the sales price for the entire Bay Area for both the SF PSMA and the San Jose PSMA. Oakland PMSA was coded missing.

[6] The coefficient of variation is the ratio of standard deviation to the mean. When calculated over time, higher coefficients of variation are associated with greater volatility.

[7] U.S. housing policy has traditionally focused on five complementary measures of housing welfare: cost burden, structural quality, crowding, neighborhood quality, and homeownership. Data at the metro level was not readily available for structural quality of the unit, and quality of the neighborhoods.

[8] Housing price-to-income ratios are slightly different from housing cost burdens. Price-income ratios apply only to ownership housing and do not account for financing. Cost burden is the ratio of yearly or monthly housing cost to yearly or monthly income, and can be calculated for both owner-occupants and tenants.

[9] Because they are self-reported, individual estimates of housing values, as reported in the American Housing Survey and dicennial census are likely to be biased, particularly in low-turnover markets and at the upper end of the distribution.

[10] As with several previous measures, the housing value Gini coefficient does not explicitly account for length of tenure. What this means is that the distribution of housing values in any given year may be very different than the cumulative distribution. These problems notwithstanding, the housing value gini coefficient still has merit as a cross-MSA comparative measure

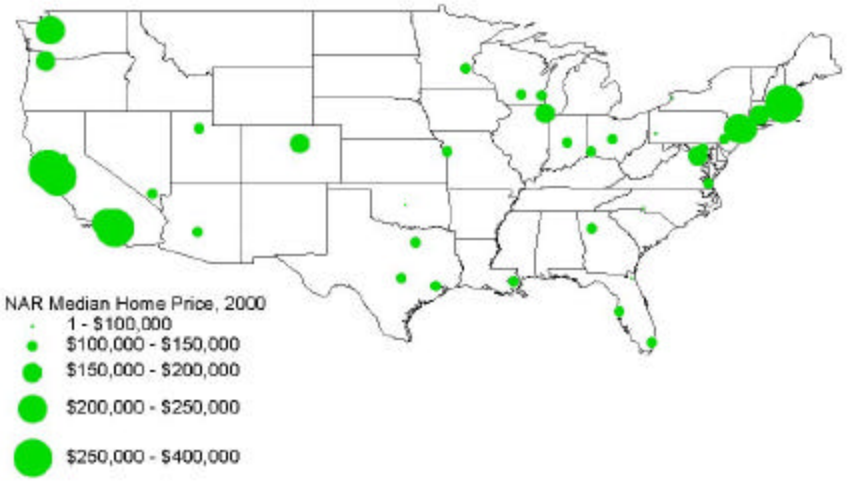
[11] As with the housing value measure discussed above, housing costs are not corrected for length of tenure.

[12] Among the sample MSAs, the distribution of monthly housing costs in 1995 was significantly less equal than the distribution of housing values.

[13] Among the sample MSAs, the distribution of monthly rents was much more equal than the distributions of either housing costs or housing values. We can not say whether this is because rental housing markets are fundamentally less bifurcated than ownership markets, or because housing value and cost estimates (as reported in the American Housing Survey) are not adjusted for length of tenure. Or because renters are mostly at the lower end of the housing expenditure continuum and the overall inequality in housing expenditures.

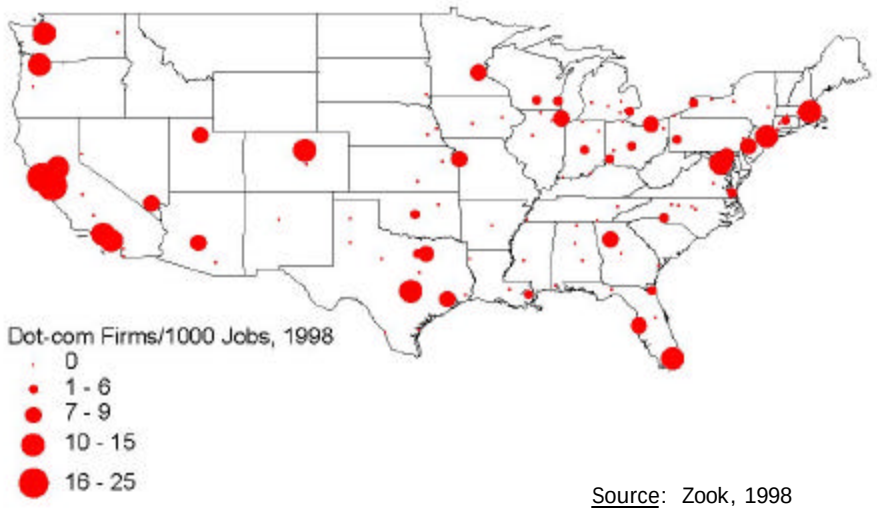
[14] Six MSAs fell out of the analysis due to missing data.

Map 1: Median Housing Prices in Selected Large MSAs, 2000



Source: National Assn. of Realtors

Map 2:Dot-com firms per 1000 Jobs in Selected Large MSAs, 1998



Source: Zook, 1998

Chart 1
High Technology Definitions by SIC Code

Milkin Institute

High Tech Manufacturing Industries

283 Drugs
357 Computer & Office Equipment
366 Communications Equipment
367 Electronics Components & Accessories
372 Aircraft & Parts
376 Guided Missiles, Space Vehicles & Parts
381 Navigation & Aeronautical Systems & Equip
382 Lab Apparatus & Optical Equipment
384 Surgical, Medical & Dental Instruments

High Tech Service Industries

481 Telephone Comm. Services
737 Computer Pgms, Data Processing
781 Motion Picture Production & Services
871 Engineering & Architectural Services
873 Research, Development & Testing Services

BLS Study of HiTech: Hecker, "A Broader View" 1999

SIC	*Industry Definition*
281	Industrial Inorganic Chemicals
282	Plastics materials & synthetics
283	Drugs
284	Soap, cleaners & toilet goods
285	Paints & Allied Products
286	Industrial organic chemicals
287	Agricultural Chemicals
289	Misc chemical products
291	Petroleum Refining
348	Ordnance and Accessories
351	Engines and Turbines
353	Construction & Related Machinery
355	Special Industry Machinery
356	General Industrial Machinery
357	Computer & Office Equipment
361	Electric distribution equipment
362	Electical industrial Apparatus
365	Household Audio & Video Equip
366	Communications Equip
367	Electronic Components & Accessories
371	Motor Vehicles & Equipment
372	Aircraft & Parts
376	Guided Missiles, Space Vehicles
381	Search and Navigation Equipment
382	Measuring & Controlling Devices
384	Medical Instruments & Supplies
386	Photographic Equip & Supplies
737	Computer & Data Processing Services
871	Engineering & Architectural Services
873	Research and Testing Services
874	Management & Public Relations

American Electronics Association

Computers & Office Equipment

3571 Electronic Computers
3572 Computer Storage Devices
3575 Computer Terminals
3577 Computer Peripherals
3578 Calculating & Accounting Machines
3579 Offices Machines

Consumer Electronics

3651 Household Audio & Video Equip
3652 Records, PreRecorded Tapes/Disks

Communications Equipment

3661 Telephone & Telegraph Equip
3663 Radio & TV Broadcast & Comm Equip
3669 Other Communications Equip

Electronic Components & Accessories

3671 Electron Tubes
3672 Printed Circuit Boards
3675 Electronic Capacitors
3676 Electronic Resistors
3677 Electronic Coils, Transformers, Inductors
3678 Electronic Connectors
3679 Other Electronic Components

Semiconductors

3674 Semiconductors & Related Devices

Industrial Electronics

3821 Laboratory Apparatus
3822 Environmental Controls
3823 Process Control Instruments
3824 Fluid Meters and Counting Devices
3825 Instruments To Measure Electricity
3826 Laboratory Analytical Instruments
3829 Other Measuring and Controlling Devices

Photonics

3827 Optical Instruments and Lenses
3861 Photographic Equipment and Lenses

Defense Electronics

3812 Search & Nav Systems

Electromedical Equipment

3844 X-Ray Apparatus
3845 Electromedical Apparatus

Communication Services

4812 Radiotelephone Communications
4813 Telephone Communications
4822 Telegraph & Other Message Commun
4841 Cable & Other Pay TV Services
4899 Other Communication Services

Software Services

7371 Computer Programming Services
7372 Prepackaged Software
7373 Computer Integrated Systems Design

Data Processing and Information Services

7374 Computer Processing & Data Prep
7375 Information Retrieval Services
7376 Computer Facilities Mgt Services

Rental, Maintenance, & Other Computer Related Services

7377 Computer Rental & Leasing
7378 Computer Maintenance & Repair
7379 Other Computer Related Services

Table 1: MSA New Economy Measures & Quartiles

	MSA	Hecker: %High-Tech Workers, 1995	MSA	AEA Workers per 1000 Jobs	MSA	Milkin Tech Pole Index, 1998	MSA	Dot-com Firms per 1000 Workers, 1998	MSA	Venture Capital Funding/1000 Workers, 1998
Top Quartile	San Jose	24.2	San Jose	22.6	San Jose	23.7	San Francisco	24.3	San Jose	20,482,378
	Detroit	10.0	Austin	11.0	Dallas	7.1	San Jose	23.4	San Francisco	12,063,459
	Orange County	8.8	Dallas	8.5	Los Angeles	6.9	Oakland	15.4	Oakland	4,986,423
	Boston	8.1	Washington, DC	6.9	Boston	6.3	San Diego	14.4	Boston	3,818,383
	Washington, DC	8.1	Boston	6.9	Seattle	5.2	Orange County	14.2	Austin	3,130,613
	Minneapolis-St.Paul	7.4	Portland (OR)	6.2	Washington, DC	5.1	Denver	13.7	San Diego	2,767,429
	San Diego	7.2	Oakland	6.0	Chicago	3.8	Seattle	13.4	Denver	2,651,751
	Cincinnati	7.2	Orange County	5.9	New York City	3.7	Austin	12.9	Seattle	2,555,063
	Newark	7.1	Denver	5.8	Atlanta	3.5	Los Angeles	12.8	Orange	1,657,326
	Oakland	7.0	Minneapolis	5.5	Phoenix	2.6	Washington, DC	12.1	Washington,DC	1,481,759
	Milwaukee	6.9	Atlanta	5.2	Orange County	2.6	Miami-Dade	12.0	Atlanta	1,227,888
2nd Quartile	Hartford	6.7	Phoenix	5.2	Oakland	2.2	New York City	11.9	Dallas	1,219,773
	Los Angeles	6.6	Seattle	5.1	Philadelphia	2.2	Portland, Oregon	11.3	Philadelphia	1,157,500
	Buffalo	6.6	Sacramento	5.1	San Diego	1.9	Boston	10.9	Baltimore	1,026,055
	Charlotte	6.5	San Francisco	5.1	Denver	1.8	Sacramento	10.6	NewYork	1,024,826
	Chicago	6.0	San Diego	4.7	Newark	1.8	Baltimore	9.6	Minneapolis-St.Paul	978,234
	San Francisco	5.8	Kansas City	4.2	San Francisco	1.6	Newark	9.4	Hartford	868,987
	Kansas City	5.6	Chicago	4.1	Houston	1.6	Kansas City	9.4	Chicago	827,763
	St Louis	5.5	Newark	4.1	Portland (OR)	1.3	Dallas	9.3	Tampa-St.Pete	803,575
	Portland (OR)	5.3	Salt Lake City	4.1	Indianapolis	1.1	Minneapolis	9.1	Columbus (OH)	772,992
	Indianapolis	5.1	Columbus (OH)	3.7	Kansas City	1.0	Atlanta	8.9	LosAngeles	745,952
	Dallas	4.9	Charlotte	3.7	Minneapolis-St.Paul	1.0	Phoenix	8.9	Phoenix	724,037
	Fort Worth	4.8	Tampa-St. Pete.	3.6	St Louis	0.9	Philadelphia	8.8	Ft. Worth	709,467
3rd Quartile	Columbus (OH)	4.8	Philadelphia	3.6	Sacramento	0.8	Tampa-St. Pete.	8.2	Houston	692,314
	Atlanta	4.7	Los Angeles	3.4	Detroit	0.8	Las Vegas	8.1	Newark	691,490
	Denver	4.6	Houston	3.2	Fort Worth	0.7	Salt Lake City	8.1	St. Louis	631,035
	Salt Lake City	4.6	Baltimore	3.2	San Antonio	0.5	Houston	7.8	Nashville	606,095
	Cleveland	4.6	Milwaukee	3.1	Pittsburgh	0.5	Chicago	7.6	Sacramento	601,573
	Phoenix	4.5	San Antonio	2.9	Tampa-St. Pete.	0.4	Nashville	6.6	Milwaukee	567,666
	Philadelphia	4.4	St. Louis	2.8	Columbus (OH)	0.4	Cleveland	6.5	New Orleans	509,696
	Seattle	4.3	Oklahoma City	2.8	Salt Lake City	0.4	Cincinnatti	6.2	San Antonio	471,878
	Sacramento	4.1	Ft. Worth	2.8	Birmingham	0.4	New Orleans	6.1	Cleveland	419,701
	Houston	4.1	New York City	2.7	Baltimore	0.4	Columbus, OH	6.1	Buffalo	414,769
	Newport News	4.0	Hartford	2.7	Cincinnati	0.3	Hartford	6.1	Salt Lake City	404,678
			Detroit	2.7			Indianapolis	6.0	Oklahoma City	397,113
Bottom Quartile	Baltimore	3.8	Cleveland	2.6	Hartford	0.3	Milwaukee	5.8	Miami	358,753
	Pittsburgh	3.7	Norfolk	2.5	Charlotte	0.3	Ft. Worth	5.7	Portland (OR)	325,153
	Oklahoma City OK	3.4	Pittsburgh	2.4	Milwaukee	0.3	St. Louis	5.6	Kansas City	310,134
	New York	3.1	Indianapolis	2.2	Cleveland	0.2	Oklahoma City	5.2	Indianapolis	261,873
	Miami	2.9	Cincinnatti	2.2	Miami-Dade	0.1	Charlotte	5.2	Charlotte	251,607
	Birmingham	2.8	Miami-Dade	2.2	Oklahoma City	0.1	Buffalo	5.2	Cincinnati	214,681
	Tampa-St. Pete.	2.8	Nashville	0.0	Newport News	0.1	Detroit	5.1	Jacksonville	197,272
	New Orleans	2.5	Jacksonville	0.0	Providence	0.1	Pittsburgh	5.1	Pittsburge	193,548
	Providence	2.4	Memphis	0.0	Buffalo	0.1	San Antonio	5.0	Detroit	95,475
	Memphis	1.7	New Orleans	0.0	New Orleans	0.1	Jacksonville	4.9	Norfolk	73,497
	San Antonio	1.5	Las Vegas	0.0	Memphis	0.1	Norfolk, VA	4.6	Memphis	4,253
			Buffalo	0.0			Memphis	4.3	Las Vegas	n/a

Table 2: Correlations Coefficients Comparing New Economy Indices

	Dot-com Firms per 1000 Jobs, 1998	Venture Capital Funding per 10,000 Jobs, 1998	Milkin TechPole Index, 1998	1998 AEA Workers/ Total Jobs	1995 Hecker Hi-Tech Employees/ Total Jobs
Dot-com Firms per 1000 Jobs, 1998	1.00	0.80	0.62	0.69	0.53
Venture Capital Funding per 10,000 Jobs, 1998		1.00	0.79	0.79	0.75
Milkin TechPole Index, 1998			1.00	0.85	0.80
1998 AEA Workers/Total Jobs				1.00	0.81
1995 Hecker Hi-Tech Employees/Total Jobs					1.00
Mean	9.14	$1,625,018.9	2.08	4.10	5.49
Standard Deviation	4.40	$3,401,312.5	3.72	3.56	3.43
N	47	47	47	47	47

Table 3: Housing Outcome Measures by Dot-com Firms/1000 Jobs Quartile

Housing Outcome Measures		Source	All Metro Areas	Top Dotcom Quartile	2nd Dotcom Quartile	3rd Dotcom Quartile	Bottom Dotcom Quartile
Price Measures	Median MSA Housing Price, 2000 (1998$)	National Association of Realtors	$156,640	$235,568	$151,294	$128,999	$98,012
	Median MSA Housing Price, 1993 (in 1998$)	National Association of Realtors	$131,531	$190,818	$127,092	$113,273	$95,345
	Percent Change in MSA Housing Price, 1993-2000	National Association of Realtors	9.1%	6.8%	10.5%	11.1%	7.5%
	Median MSA Housing Price Coefficient of Variation, 1993-2000	National Association of Realtors	7.4	9.841	8.259	6.395	4.992
Housing Welfare Measures	1998 MSA Homeownership Rate	U.S. Dept.of Housing & Urban Dv.	63.70%	56.9%	64.2%	66.8%	67.2%
	1993 MSA Homeownership Rate	U.S. Dept.of Housing & Urban Dv.	60.10%	54.9%	62.3%	59.8%	63.2%
	1998 Median Housing Price-to-Income Ratio	calculated	4.7	5.9	4.5	4.2	3.8
	1993 Median Housing Price-to-Income Ratio	calculated	4.9	6.5	4.7	4.3	4.0
	1995 Average Persons per Room	American Housing Survey	0.48	0.52	0.48	0.47	0.46
Distributional Measures	1995 Housing Cost Gini Coefficient	American Housing Survey	0.344	0.340	0.336	0.343	0.361
	1995 Housing Value Gini Coefficient	American Housing Survey	0.302	0.270	0.300	0.307	0.343
	1995 Rent Gini Coefficient	American Housing Survey	0.212	0.188	0.212	0.219	0.237

Table 4: Median Housing Price Regression Model Results

Model		Coefficient Estimates and probability levels			
		Type I: No New Economy Variables	Type II: Includes dot-com firms per 1000 workers	Type III: Includes top dot-com firm quartile dummy variable	Type IV: Includes dot-com interaction effects
Dependent Variable: 2000 MSA Median Home Price					
Independent Variables					
PCINC93	1993 MSA per capita income (in thousands)	12.607***	5.328***	10.791***	4.652**
%JOBCH	1993-98 percent job change	1.142	-.540	0.973	-.627
SUPPLY-FLEX	1993-98 Residential building permits/job growth	-2.028***	-.868**	-1.606**	-.706*
NE-INDEX	Dot-com firms/1000 workers		10.519***		11.691***
NE-DV	Top quartile MSAs based on dot-com firms/1000 workers			44.416**	
Income Interaction term	NE-PCINC: PCINC * NE-DV				0.52
Supply-flex Interaction term	SUPPLY-FLEX * NE-DV				-0.958
Constant		-115.06*	-39.662	-92.705	-34.444
R-squared		0.67	0.83	0.72	0.83
Observations		41	41	41	41

* indicates significant at the .10 probability level
** indicates significant at the .05 probability level
*** indicates signfiicant at the .01 probability level

Table 5: Housing Price Change and Volatility Regression Results

Model		Coefficient Estimates and probability levels			
		Type I: No New Economy Variables	Type II: Includes dot-com firms per 1000 workers	Type III: Includes top dot-com firm quartile dummy variable	Type IV: Includes dot-com interaction effects
Dependent Variable: Percent Change in Median Home Price, 1993-98					
Independent Variables					
PRICE93	1993 Median home price	-.060	-.191**	0.091	-0.139
PCINC93	1993 MSA per capita income (in thousands)	1.084	0.686	1.138	0.274
%JOBCH	1993-98 percent job change	.874**	.490*	.851***	.300
SUPPLY-FLEX	1993-98 Residential building permits/job growth	-0.578**	-.460***	-.557***	0.195
NE-INDEX	Dot-com firms/1000 workers		2.90***		3.962***
NE-DV	Top quartile MSAs based on dot-com firms/1000 workers			5.77	
Income Interaction term	NE-PCINC: PCINC * NE-DV				-0.54
Supply-flex Interaction term	SUPPLY-FLEX * NE-DV				0.195
Constant		4.757	11.968	5.381	-11.628
R-squared		0.36	0.45	0.36	0.32
Observations		41	41	41	41
Dependent Variable: 1993-98 Median Home Price Coefficient of Variation					
Independent Variables					
PRICE93	1993 Median home price	0.016	-0.023	0.01	-0.015
SUPPLY-FLEX	1993-98 Residential building permits/job growth	-.090**	-.060	-.083*	
NE-INDEX	Dot-com firms/1000 workers		.630***		.919***
NE-DV	Top quartile MSAs based on dot-com firms/1000 workers			1.26	
Income Interaction term	NE-PCINC: PCINC * NE-DV				-0.118
Supply-flex Interaction term	SUPPLY-FLEX * NE-DV				0.016
Constant		8.8***	7.03**	9.104***	1.77
R-squared		0.18	0.33	0.18	0.31
Observations		44	44	44	44

* indicates significant at the .10 probability level
** indicates significant at the .05 probability level
*** indicates signfiicant at the .01 probability level

Table 6: Homeownership, Burden, and Overcrowding Regression Model Results

Model		Coefficient Estimates and probability levels			
		Type I: No New Economy Variables	Type II: Includes dot-com firms per 1000 workers	Type III: Includes top dot-com firm quartile dummy variable	Type IV: Includes dot-com interaction effects
Dependent Variable: 1998 MSA Homeownership Rate					
Independent Variables					
HO_RATE93	1993 Homeownership Rate	.827***	.792***	.764***	.817***
EMP98/POP98	Jobs-Population Ratio in 1998	.203*	.327**	.231**	.331**
SUPPLY-FLEX	1993-98 Residential building permits/job growth	.107**	0.03	0.074	0.012
NE-INDEX	Dot-com firms/1000 workers		-.528**		-.532*
NE-DV	Top quartile MSAs based on dot-com firms/1000 workers			-3.465*	
Demand Interaction term	EMP98/POP98 * NE-DV				-0.036
Supply-flex Interaction term	SUPPLY-FLEX * NE-DV				0.066
Constant		-2.715	-0.644	-1.441	-1.789
R-squared		0.68	0.73	0.70	0.77
Observations		44	44	44	44
Dependent Variable: 1998 Housing Price-to-Income Ratio					
Independent Variables					
PRICE/INCOM93	1993 Median Housing Price-to-Median Income Ratio	.770***	.795***	0.797***	.832***
EMP98/POP98	Jobs-Population Ratio in 1998	0.013	0.017	0.0155	0.021
SUPPLY-FLEX	1993-98 Residential building permits/job growth	-.0122**	-.0128**	-.0128**	-.017**
NE-INDEX	Dot-com firms/1000 workers		-.0131		0.023
NE-DV	Top quartile MSAs based on dot-com firms/1000 workers			-.158	
Demand Interaction term	EMP98/POP98 * NE-DV				-.019*
Supply-flex Interaction term	SUPPLY-FLEX * NE-DV				0.028*
Constant		0.538	0.329	0.331	-0.18
R-squared		0.88	0.88	0.88	0.89
Observations		43	43	43	43
Dependent Variable: Change in Persons per Room, 1985-95					
Independent Variables					
PRICE/INCOM95	1995 Median Housing Price-to-Median Income Ratio	-.012***	-.018***	-.016***	-.018***
SUPPLY-FLEX, 1990-95	1990-95 Residential building permits/job growth	0.000	0.000	0.00	0.00
NE-INDEX	Dot-com firms/1000 workers		.048**		0.02
NE-DV	Top quartile MSAs based on dot-com firms/1000 workers			.030**	
Demand Interaction term	PRICE/INCOM95 * NE-DV				0.004
Supply-flex Interaction term	SUPPLY-FLEX * NE-DV				0
Constant		.079***	.098***	.092***	0.097
R-squared		0.15	0.25	0.27	0.24
Observations		42	42	42	42

* indicates significant at the .10 probability level
** indicates significant at the .05 probability level
*** indicates signfiicant at the .01 probability level

Table 7: Housing Value and Cost Gini Coefficient Regression Results

Model		Coefficient Estimates and probability levels			
		Type I: No New Economy Variables	Type II: Includes dot-com firms per 1000 workers	Type III: Includes top dot-com firm quartile dummy variable	Type IV: Includes dot-com interaction effects
Dependent Variable: Gini Coefficient for Housing Value, 1995					
Independent Variables					
HSGVAL_GINI85	Housing Value GINI Coefficient, 1985	.882**	.883***	.886***	.882***
PCINC85	1985 MSA per capita income (in thousands)	-.005**	-.005*	-.004*	-.004**
%JOBCH	1985-95 percent job change	0.00	0.00	-.000	0.00
SUPPLY-FLEX	1990-95 Residential building permits/job growth	0.00	0.00	0.00	-0.00
NE-INDEX	Dot-com firms/1000 workers		0.002		-0.001
NE-DV	Top quartile MSAs based on dot-com firms/1000 workers			0.004	
Income Interaction term	NE-PCINC85: PCINC * NE-DV				0.00
Supply-flex Interaction term	SUPPLY-FLEX * NE-DV				0.00
Constant		.126**	.128*	.132*	.131*
R-squared		0.77	0.76	0.76	0.75
Observations		44	44	44	44
Dependent Variable: Gini Coefficient for Monthly Housing Cost, 1995					
Independent Variables					
HSGVAL_GINI85	Housing Value GINI Coefficient, 1985	.728***	.748***	.729***	.749***
PCINC85	1985 MSA per capita income (in thousands)	-.003*	-0.002	-.002	-.002
%JOBCH	1985-95 percent job change	-.001***	-.001**	-.001**	-.001**
SUPPLY-FLEX	1990-95 Residential building permits/job growth	0.00	0.00	0.00	0.00
NE-INDEX	Dot-com firms/1000 workers		-0.014		-0.024
NE-DV	Top quartile MSAs based on dot-com firms/1000 workers			-0.001	
Income Interaction term	NE-PCINC85: PCINC * NE-DV				0.00
Supply-flex Interaction term	SUPPLY-FLEX * NE-DV				0.00
Constant		.178**	.153**	.176**	.162**
R-squared		0.49	0.49	0.48	0.47
Observations		44	44	44	44
Dependent Variable: Gini Coefficient for Monthly Rent, 1995					
Independent Variables					
RENT_GINI85	Rent GINI Coefficient, 1985	.310***	.291***	.318***	.279***
PCINC85	1985 MSA per capita income (in thousands)	-.003**	-0.002	-0.003	-0.002
%JOBCH	1985-95 percent job change	-.000	-.000	-.000	-.000
SUPPLY-FLEX	1990-95 Residential building permits/job growth	0.00	0.00	0.00	0.00
NE-INDEX	Dot-com firms/1000 workers		-0.022		-0.027
NE-DV	Top quartile MSAs based on dot-com firms/1000 workers			-0.008	
Income Interaction term	NE-PCINC85: PCINC * NE-DV				0.00
Supply-flex Interaction term	SUPPLY-FLEX * NE-DV				0.00
Constant		.228***	0.206***	.208***	.212***
R-squared		0.41	0.43	0.41	0.4
Observations		44	44	44	44

* indicates significant at the .10 probability level
** indicates significant at the .05 probability level
*** indicates signfiicant at the .01 probability level