

Does a High-Tech Boom Worsen Housing Problems for Working Families?

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Abstract

In this article, we analyze the impact of high-tech economic growth on the incidence of critical housing problems both among all households and among moderate-income working families in major metropolitan areas. We rely on 1999 survey data, supplemented by other more recent data on housing market dynamics and building code enforcement.

Overall, we found that the level of high-tech activity affects, positively and significantly, the incidence of critical housing problems for all households and especially for moderate-income working households, regardless of tenure. Consistent with anecdotal information about the problems of working families, we found a stronger impact on moderate-income working households than on all households. We conclude that housing policy should be broadened to address the problems of working families as well as those of the poor, especially when the problems arise from rapid economic growth.

Keywords: Affordability; Housing; New economy

Introduction

Over the past two decades, a new economy has become apparent in the United States. Despite being commonly used by the mainstream media, the term “new economy” lacks a clear definition. One reason is that the outward signs of the new economy are also its causes (Progressive Policy Institute 2001). Often, the term is used to refer to activities that rely on the use of new technologies, such as personal computers, high-speed telecommunications, and the Internet. In addition, the term has been used to refer to business activities in a global economy characterized by speed, flexibility, innovation, and new organizational models. This type of activity has also been labeled the “network economy,” the “digital economy,” the “knowledge economy,” and the “risk society” (Progressive Policy Institute 2001).

This new economy has fueled the economic expansion of the past few years and made wealth accessible to many. Unfortunately, there is increasing anecdotal evidence linking the so-called new economy boom to the housing problems of many Americans.

Economic good times are paradoxically creating a housing crisis for many Americans. (U.S. Department of Housing and Urban Development (HUD) 2000a, viii)

[I]n one area of the economy, the opposite of trickle down occurs. This perverse exception is the housing market. Because the supply of well located land is more or less fixed, rising prosperity tends to drive up its price, making it harder for non-homeowners with steady incomes to afford it. (Home Truths 2000, A38)

The new high tech global economy that is pumping up employment and homeownership in most cities is also creating staggering jumps in home prices and raising rents more than 1½ times faster than the rate of inflation. (Lardner 2000, A1)

The shortage of affordable housing has reached extreme proportions in some new economy areas. For instance, in 1999, 34 percent of the homeless population in Santa Clara County (CA), estimated at 20,000, had full-time jobs, up from 25 percent in 1995. “More teachers, police officers, firefighters, commissioned sales people—all people who make more than \$50,000 a year and would be comfortably middle-class in many other places—are seeking the services of homeless shelters in Silicon Valley” (Nieves 2000, L20).

Two central factors determine the availability of affordable housing: adequate incomes and a sufficient supply of this kind of housing. Unfortunately, local press accounts, planning studies, and other such reports suggest that the new economy may have negative impacts on both of these factors.

In general, rents are rising faster than inflation and much more rapidly than the incomes of many households. This is especially true among low-skilled workers in service industries, including cashiers and restaurant workers, whose income decreased from 1991 to 1999 even without controlling for inflation. But it is also true for many higher-skilled workers in critical occupations. Teachers’ wages increased over the 1991 to 1997 period but did not keep up with inflation. Similarly, the wages of law enforcement professionals barely kept up with inflation (Barta 2000).

More than ever, the economy puts a premium on highly educated people. As a result, differences in the earnings and wealth of those at the top and those at the bottom have widened. For instance, from 1977 on, the cash earnings of the poorest fifth of the U.S. population actually fell about 9 percent, middle-class earnings rose 8 percent, and upper-income earnings rose 43 percent (Murphy 2000). In the 1990s, at the same time that earnings for the bottom fifth grew less than 1 percent, they jumped 15 percent for the top fifth (Walsh 2000). In all likelihood, with the new economy, income shifted toward more highly skilled workers because employers pay more for their services (Murphy 2000).

Another characteristic of the new economy is occupational change.

Between 1969 and 1995, virtually all the jobs lost in the production or distribution of goods have been replaced by jobs in offices. Today, almost 93 million American workers (which amounts to 80 percent of all jobs) do not spend their days making things—instead, they move things, process or generate information, or provide services to people. (Progressive Policy Institute 2001)

Moreover, service occupations are likely to command lower wages than the manufacturing jobs they replaced.

At the same time as the wages of many barely keep up with inflation, there is increasing evidence of spiraling housing costs and growing housing shortages. In response to the economic expansion of the past decade, private developers have concentrated production at the high end of the market. This helps explain why the median rent in unsubsidized apartment buildings, after adjusting for inflation, rose a striking 16 percent—from \$645 in 1994 to \$724 in 1997 (Joint Center for Housing Studies 1999). Newer apartments are even more expensive—completions from the third quarter of 1998 through the third quarter of 1999 had median rents of \$773 (U.S. Bureau of the Census 1999b). In new economy areas, asking rents in 1998 were considerably higher than the national average: 16 percent higher in the Northeast and 10 percent more in the West. Similarly, vacancy rates and the share of housing affordable to very low income households are significantly lower than in non-high-tech metropolitan areas (Nelson 2001).

The popular media have expressed fears that the new economy bubble may have recently burst (Johnson 2001). However, the trends that characterized the new economy—the importance of globalization, new technologies, innovation, and the ongoing move toward a service economy—are likely to remain. As a result, the high-skilled workers of the new economy are likely to see further gains in earnings and wealth, while those working in lower-skill, nontechnical servicing jobs may not see such gains (Brinsley 1999).

Recent housing evidence is consistent with these fears. The proportion of nonelderly, nondisabled households that had so-called worst-case housing problems and earnings as their primary income has grown from 66 percent in 1991 to 80 percent in 1999 (HUD 2001). This suggests that housing problems are no longer just a poverty issue. Having a job does not guarantee a family a decent place to live at an affordable cost. More than 3 million moderate-income working households had critical housing needs in 1997—that is, they spent more than half their income on housing or lived in severely substandard housing (Stegman, Quercia, and McCarthy 2000).

Despite growing evidence, it is still not clear how variables such as the types of jobs created, the wage levels paid, the population trends, and the ability of the industry to supply housing affect low-income housing needs in a community (Housing Assistance Council 2000). The purpose of this article is to examine the relationship between one aspect of the new economy (the growth in dot-com firms) and the incidence of critical housing problems among all households and among low- and moderate-income working households.

The remainder of this article is divided into five sections. We first present a conceptual model that can be used to assess the relationship between a high-tech boom and the incidence of housing problems. Next, we describe the data and methods used to test the hypotheses derived from the conceptual model. In the following two sections, we discuss the empirical findings, and in the last section, we derive implications for future research and policy.

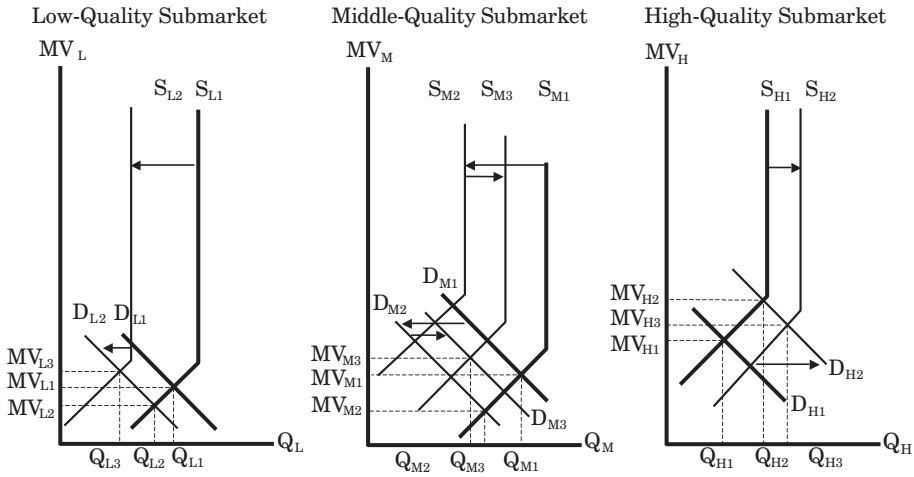
A simplified model of the urban housing market

We can illustrate the expected impacts of a high-tech boom on low- and middle-income housing with the use of a theoretical model of the urban housing market. Consistent with Rothenberg et al. (1991), we consider an urban housing market to be a segmented, interconnected array of housing quality submarkets. For simplicity, we assume three quality submarkets (low, medium, and high) and omit distinctions between owners and renter-occupied units.

Initially, all submarkets can be assumed to be in general equilibrium, as specified by the original market period demand and supply functions shown in figure 1 (D_{L1} , S_{L1} ; D_{M1} , S_{M1} ; and D_{H1} , S_{H1} , respectively). The corresponding equilibrium quantities and market valuations are Q_{L1} , Q_{M1} , Q_{H1} , MV_{L1} , MV_{M1} , and MV_{H1} , respectively. Equilibrium is upset by dramatic improvements in the region's economic health "such that numerous households originally housed in middle quality sub-market M have substantially higher real incomes" (Rothenberg et al. 1991, 234) because of high-tech or new economy employment.

Assuming that many of these now better-off households wish to improve on the quality of the housing they consume, this would result in an increased demand in the high submarket. This is reflected in the shift of D_{H1} to D_{H2} in figure 1 and a decrease in the demand in the middle submarket from D_{M1} to D_{M2} . Increased demand will raise valuations in the high submarket (from MV_{H1} to MV_{H2}). As a result of higher market valuations, property owners in the middle submarket will upgrade units to the high submarket to capture higher returns. This is reflected

Figure 1. Submarket Adjustments to Rapid High-Tech Growth



in the shift from S_{M1} to S_{M2} in the middle submarket and from S_{H1} to S_{H2} in the high submarket. With increased supply in the high submarket, market valuations will decrease (from MV_{H2} to MV_{H3}). As long as new construction is not put in place, the resulting market valuations are likely to be above original levels ($MV_{H3} > MV_{H2}$).

By contrast, market valuations and rates of return for owners in the middle submarket may decrease at least in the very short run market period (from MV_{M1} to MV_{M2}). This will be in response to now more affluent middle submarket households moving to higher-quality housing. As a result of initial lower market valuations in the middle submarket, the more affluent low submarket households are likely to move to that destination (D_{L1} to D_{L2} and D_{M2} to D_{M3}). In the low submarket, a decrease in the supply of housing (S_{L1} to S_{L2}), upgraded to the middle submarket, is likely to result from the decrease in demand (D_{L1} to D_{L2}).

It is possible that submarket equilibrium market valuations will return to earlier levels, even in the presence of a high-tech or new economy boom. However, this can be expected to occur only if substantial new construction is put in place and other factors are held constant. As long as these conditions do not take place, market valuations are likely to be higher than they were before the high-tech boom. This will increase the housing problems of households, especially those not linked to the high-tech sector and those whose incomes are tied to the old economy service sector.

Rothenberg et al. (1991) clarify that submarket equilibrium market valuations are established through the interaction of short-run market

period and medium-run demand and supply conditions and that these conditions will be altered with any change in the determinants of any of these functions.

Thus, in the short-run market period, several factors are likely to affect market valuations in general and households' affordability levels in particular, among them population changes both in terms of number and characteristics, including education levels, age, marital status, and others; the availability of government subsidies; the extent to which property owners can downgrade/upgrade existing stock; and other locational factors. In the short-run market period, no new construction can be put in place.

Over the longer run, new construction can bring market valuations down because of increased supply. However, if the economy continues to expand over a longer period of time (e.g., from 1992 to 2000), the rates of return from continuing to supply housing to lower-quality submarkets are likely to diminish in relative terms. Prospectively, relative returns will be higher from serving the higher submarkets, via new construction, upgrading, converting units to nonresidential uses, or demolishing structures and replacing them with higher-quality, more intensive residential uses. The resulting higher market valuations will worsen the affordability problems of most households, regardless of submarket.

The empirical evidence from the 1990s is consistent with these contentions.

The number of units affordable to renters with extremely low incomes dropped by 750,000 (a 13 percent drop) and the total number of units affordable to renters with very low incomes fell by 1.14 million (a 7 percent drop) between 1997 and 1999. (HUD 2001, 8)

In metropolitan areas, where the competition for central-city land by high-income households and nonresidential users has grown most intense, the loss of lower-quality stock to alternative uses is likely to be most severe (Rothenberg et al. 1991). This may be the case in urban areas with development restrictions, whether in the form of strong growth controls, strict building code enforcement, or other methods. By design, growth controls are intended to limit the amount of land for development and to promote competition for infill or central-city redevelopment. This can have a dramatic effect on prices. For instance, in Portland (OR), the instant land is moved inside the urban growth boundary, its value jumps from \$15,000 to \$150,000 an acre (Robbins 2001). Similarly, strict building code enforcement may increase building

costs or be a disincentive to property owners considering downgrading their units to serve lower-income households. Thus, when market conditions are tight and building codes are strictly enforced, housing may not be converted downward for use by lower-income households. In either case, in the presence of a continued economic boom, the whole array of housing submarkets may move upward in valuation. Even aging units may become upgraded (gentrified) and occupied by higher-income households.

Consequently, with a declining supply of lower-cost housing, we would expect to see low- and moderate-income households being forced to spend more of their income on housing or settling for less adequate housing. The available evidence cited earlier suggests that price pressures are greater in high-tech areas, while wage growth in many old economy jobs is declining, in either inflation-adjusted or -unadjusted terms. Therefore, in the short run, high-tech economic growth is expected to lead to an increase in critical housing problems. Moreover, given that high-tech growth appears to exacerbate income inequality, it may affect the incidence of housing problems, probably even over and above the impact of overall economic growth.

Fully addressing these issues is beyond the scope of this article and beyond the limits of the data we have available. However, in our statistical analysis, we do include proxies for these factors and control for household characteristics that may affect housing problems.

Methodology and data

In this section, we describe the methodology and data used to test the contention that a high-tech boom is likely to affect, in the short-run market period, the affordability problems of households.

Our resulting statistical model takes the form of a logistic regression:

$$\ln [P(\text{CHN})_i / (1 - P(\text{CHN})_i)] = \beta_0 + \beta_1 \text{1st Quartile Dot-com Firms} + \beta_2 \text{2nd Quartile Dot-com Firms} + \beta_3 \text{Percent Change in Employment} + \beta_4 \text{Strict Building Code Enforcement} + \beta_1 \text{Household-Level Control Variables} + \mu_i \quad (1)$$

- Where $\ln [P(\text{CHN})_i / (1 - P(\text{CHN})_i)]$ is the log-odds of having critical housing needs (CHN) for the i th household. A household is defined as having critical housing needs if it spends more than half its total income on housing and/or lives in a severely inadequate unit. This is the same definition used by HUD in defining “worst case” needs,

although HUD restricts its analysis to unassisted very low income renters (HUD 2000b). This variable is calculated using data from the 1999 American Housing Survey (U.S. Bureau of the Census 2001).

- 1st Quartile Dot-com Firms and 2nd Quartile Dot-com Firms are dummy variables indicating whether a metropolitan area is in the top or second quartile of a measure of the number of “dot-com” firms per 1,000 employees in 1998 (see Landis and Elmer 2001).
- Percent Change in Employment is the change in the number of employed persons in a metropolitan area between 1992 and 1997, as a percentage of employed persons in 1992. These data come from the *State of the Cities 2000* (HUD 2000a).
- Strict Building Code Enforcement is a dummy variable indicating whether a metropolitan area strictly enforces building codes (Burby, May, and Paterson 1998; Burby et al. 2000). This is included as a metro-level control variable.
- Household-Level Control Variables include the respondent’s ethnicity, age, marital status, and education; the number of children and wage earners in the household; whether the property is located in the central city (the omitted category is suburban/rural); and, for renters only, whether the household receives government housing assistance. These variables were calculated using data from the 1999 American Housing Survey (U.S. Bureau of the Census 2001).
- $\beta_0, \beta_1, \beta_2$, etc. are fixed regression coefficients; μ_i is an error term with a logistic distribution.

We estimated this model separately for owners and renters, as well as for the general population and for moderate-income working households. Moderate-income working households are defined following Stegman, Quercia, and McCarthy (2000): that is, households that earned at least half of their income from employment and whose earnings and total income fell between \$10,700—the equivalent of a full-time job at minimum wage—and 120 percent of the local area median income. This definition includes about half of all working households in the country, regardless of income.

The number of dot-com businesses per 1,000 private workers was drawn from Landis and Elmer (2001), who collected the data using a search engine for domain names on the Internet. The data date from 1993 and are considered reliable through 1998, when there was another

dramatic increase in Web domains. In their study of how the new economy affects housing markets, Landis and Elmer (2001) compared the performance of numerous high-tech indicators and found that this measure worked best. The indicator performed similarly well in the analyses for this article, and using the same variable allows readers to compare the two studies.

The inclusion of the above variable in the analysis allows us to capture the impact of high-tech growth but cannot be used to address the question of whether our results are due to growth in the high-tech economy specifically or, perhaps, to growth in the overall economy. Given data availability, we have included the percentage growth in overall employment between 1992 and 1997 as a proxy for overall economic growth in order to address this question.

Of all the control variables, the presence and type of development restrictions may be the most interesting because of their implicit treatment in the literature (Burby, May, and Paterson 1998; Rothenberg et al. 1991; Burby et al. 2000). Burby, May, and Paterson (1998, 2000) use a national sample of 819 city and county governments to study local enforcement practices and philosophies. In the present study, we include one of the measures developed by Burby, May, and Paterson (1998): the strictness of building code enforcement in central cities. This variable is derived from a factor analysis that compared 155 cities in terms of five measures: the use of standard deterrent enforcement tools, degree of standardization and supervision of the work of field inspectors, the use of technical assistance techniques, the use of incentives to attain compliance, and the use of flexible enforcement tools. Burby et al. (2000) found that these measures loaded on two distinct factors, a systematic philosophy (represented by the first three measures listed above) and a facilitative philosophy (represented by the last two measures listed above).

The variable used in the regression model (labeled Strict Building Code Enforcement) is a dummy coded 1 if a city scored high on the systematic factor and low on the facilitative factor and 0 otherwise. Thus, Strict Building Code Enforcement can be considered a proxy variable for a number of development restrictions because it can affect both the cost of new construction and the relative ability of property owners to downgrade housing units to meet the needs of lower-income households. It should be noted that, although this variable captures the building code enforcement philosophy in the central city, we use it to capture development restrictions in the whole primary metropolitan statistical area (PMSA). The lack of significance of the central-city dummy in the econometric models gives us some indication that the effect of this variable holds for both central-city and suburban

locations. To further corroborate this usage, we also examined, in results not reported here, the interaction of strict building code enforcement with a dummy variable for central-city respondents. This interaction had an insignificant effect on the incidence of critical housing needs.

It should be noted that the dot-com firms and percent change in employment data are available at the PMSA level, while the building code enforcement measure is based on central-city data. Not all data were available for each metropolitan area. The appendix lists the 34 metropolitan areas included in the study.

Weighted logistic regression models were estimated using Stata. Unweighted regressions (not reported) were also estimated with no substantial differences in model results.

Critical housing needs of all households

In 1999, there were 13.7 million households with critical housing needs (table 1). This represents an increase of approximately 5 percent in the incidence of critical housing needs since 1997. This fact is noteworthy because HUD actually reports a decrease in the number of “worst case” needs between 1997 and 1999 (HUD 2001).

In 1999, about 3.7 million of the households with critical housing problems were elderly. Another 3.1 million were unemployed or on welfare. The remaining 6.3 million were working households; of these, only 2.5 million households were marginally attached to the labor market. The great majority of working households with critical housing needs have higher income and thus belong squarely in the ranks of the middle class. Compared with 1997, these moderate-income working households experienced the largest increase in critical housing needs, from 3 million to 3.7 million, or about a 22 percent increase.

Critical housing needs are primarily the result of severe cost burden (the household spends more than half its income on housing) rather than severe inadequacy. Of the 13.7 million households with critical housing needs, 11.7 million have severe cost burdens only, 1.7 million are severely inadequate only, and 0.4 million have both problems (the differences are due to rounding error). The proportions are similar for moderate-income working families, with 2.9 million being severely cost burdened only, 0.7 million living in severely inadequate housing only, and 0.1 million experiencing both problems.

Table 1. Working Status of Households with Critical Housing Needs, United States, 1997 and 1999 (In Thousands)

	1997		1999	
	Number	Percent	Number	Percent
Elderly, not working	3,753	27.5	3,683	26.8
Nonelderly, not working	3,531	25.8	3,118	22.7
Marginally employed ^a	2,939	21.5	2,522	18.3
Moderate-income working households ^b	3,046	22.3	3,747	27.3
High-income households ^c	398	2.9	673	4.9
Total ^d	13,667	100.0	13,743	100.0
As a percentage of all U.S. households		12.2		12.0

Source: 1997 and 1999 American Housing Surveys (U.S. Bureau of the Census 1999a, 2001) and authors' calculations.

^aMarginally employed include households with earnings from wages between \$2,675 and \$10,700 (one-quarter to full-time minimum wage). Not working is defined as earning less than a one-quarter-time minimum wage.

^bModerate-income are households whose total income is between \$10,700 and 120 percent of the area median income and whose wage earnings account for at least half the total household income.

^cHigh-income are households whose total income exceeds 120 percent of the area median income, regardless of income sources.

^dThe reported categories are not exhaustive. For example, households whose total income falls between \$10,700 and 120 percent of the area median income but whose wage earnings account for less than half the total household income are not included in any category. In 1999, approximately 57,000 households with critical housing needs fell into this category. These households are included in subsequent tables that detail the characteristics of all households.

The incidence of critical housing problems varies dramatically by tenure, ethnic/racial groups, and location (table 2). Across all categories, renters are more likely—often nearly twice as likely—to experience problems than owners. Critical housing problems also vary from place to place. For both renters and owners, the incidence of problems is greater in the Northeast and the West, followed by the Midwest and the South. In all regions, non-Hispanic blacks and Hispanics are more likely than non-Hispanic whites to experience critical housing problems. For instance, about 21 percent of all white renters in the Northeast experienced problems in 1999, compared with almost 28 percent for blacks. This pattern is consistent across regions. Regardless of region or tenure, Hispanics as a rule are less likely to have critical housing problems than blacks.

Critical housing problems are not confined to the nation's cities. In fact, most households with critical housing problems live in suburban and nonmetropolitan areas (table 3). About 5.6 million households with problems lived in central cities in 1999, compared with 5.4 million in the suburbs and 2.9 million in nonmetropolitan areas. Renters who live in central-city or suburban locations are more likely to have problems

Table 2. Incidence of Critical Housing Needs, by Race, Ethnicity, Tenure, and Region, United States, 1999 (Percents)

	Northeast	Midwest	South	West	Total United States
Non-Hispanic whites					
Renters	21.1	17.7	16.2	19.4	18.4
Owners	10.3	7.2	8.0	10.8	8.8
Non-Hispanic blacks					
Renters	27.8	27.2	27.1	28.3	27.4
Owners	17.0	15.2	12.1	15.6	13.6
Hispanics					
Renters	28.7	22.8	18.3	26.2	24.2
Owners	16.0	8.1	12.2	15.8	13.6
All households	14.2	10.1	10.7	14.3	12.0

Source: 1999 American Housing Survey (U.S. Bureau of the Census 2001) and authors' calculations.

Table 3. Metropolitan Location of Households with Critical Housing Needs, by Tenure, United States, 1999 (In thousands)

	Central City	Suburbs	Nonmetropolitan	Total
All households				
Renters	3,757 (52.1)	2,697 (37.4)	756 (10.5)	7,210 (100)
Owners	1,789 (27.1)	2,680 (40.7)	2,121 (32.2)	6,590 (100)
Total*	5,546 (40.2)	5,377 (39.0)	2,877 (20.9)	13,800 (100)
Working families				
Renters	1,068 (55.2)	702 (36.3)	165 (8.5)	1,935 (100)
Owners	553 (30.5)	803 (44.3)	455 (25.1)	1,811 (100)
Total	1,621 (43.3)	1,505 (40.2)	620 (16.5)	3,746 (100)

Source: 1997 and 1999 American Housing Surveys (U.S. Bureau of the Census 1999a, 2001) and authors' calculations. Numbers in parentheses are row percentages.

Note: Numbers do not total 100 percent because of rounding.

*The total of 13,800,000 includes the 57,000 households with critical housing needs with "other" working status (see table 1, note d).

than owners. The reverse is true in nonmetropolitan areas. In the latter, more than 2.1 million owners have critical problems compared with 756,000 renters. These patterns are consistent with those estimated by Stegman, Quercia, and McCarthy (2000) using 1997 American Housing Survey data. Following most of the country's population and employment growth, critical housing problems are increasingly moving to suburban and nonmetropolitan areas.

Consistent with the premises of the conceptual model, critical housing problems appear to be worst in areas with a significant high-tech presence (table 4). Regardless of tenure, metropolitan areas that ranked in the top quarter in the number of dot-com firms per 1,000 workers

Table 4. Incidence of Critical Housing Needs for All Households in Selected Metropolitan Areas, by High-Tech Status and Tenure, United States, 1999 (Percents)

Tenure Status	Those with Critical Housing Needs
Renters (N = 8,110)	
Number of dot-com firms per 1,000 workers, 1998	
Ranked in the top quartile (N = 2,832)	25.5
Ranked in the 2nd quartile (N = 2,524)	24.1
Ranked in the 3rd quartile (N = 1,750)	19.9
Ranked in the bottom quartile (N = 1,004)	19.9
Owners (N = 11,237)	
Number of dot-com firms per 1,000 workers, 1998	
Ranked in the top quartile (N = 3,023)	15.4
Ranked in the 2nd quartile (N = 3,263)	10.8
Ranked in the 3rd quartile (N = 2,740)	11.1
Ranked in the bottom quartile (N = 2,211)	8.6
All households (N = 19,347)	
Number of dot-com firms per 1,000 workers, 1998	
Ranked in the top quartile (N = 5,855)	20.2
Ranked in the 2nd quartile (N = 5,787)	17.3
Ranked in the 3rd quartile (N = 4,490)	14.5
Ranked in the bottom quartile (N = 3,215)	12.5
Number of metropolitan areas	38

Source: 1999 American Housing Survey (U.S. Bureau of the Census 2001), Burby et al. (2000), Landis and Elmer (2001), and authors' calculations. Percentages are based on weighted frequencies.

in 1998 exhibited a greater incidence of problems than lower-ranked areas. For instance, in top-ranked high-tech areas, over 20 percent of all households experienced critical problems in 1999, compared with 13 percent in areas ranked in the bottom quartile. We find similar patterns on the basis of tenure—both renters and owners in top-ranked high-tech areas are more likely to have critical problems than their counterparts in lower-ranked areas. It should be noted, however, that relative differences in the incidence of problems for renters in top-ranked and lower-ranked areas are significantly smaller than for similarly located owners. For instance, in top-ranked areas, about 26 percent of renters have critical problems, compared with about 20 percent in lower-ranked areas—about a 20 percent difference. For owners, the difference is close to 50 percent (15.4 percent compared with 8.6 percent, respectively). Also, renters in areas that rank in the second quartile exhibit much higher rates of critical housing needs than renters in lower-ranked areas do, while we do not see this for owners.

We estimate a logistic regression to assess the impact of high-tech presence in an area on the incidence of critical housing problems,

while controlling for other factors. The dependent variable is a binary one (0/1) that captures whether a household has critical housing needs. Descriptive statistics of the model variables are presented in table 5. Owners and renters appear to be two distinct populations. Owners are more likely to be older (52 years old compared with 42) and to have more earners in the households than renters do (1.42 earners compared with 1.22). Moreover, owners are more likely to live in areas with slightly higher overall employment growth (mean metropolitan-area employment growth is 13.2 percent for owners versus 11.6 percent for renters), less likely to live in top-ranked high-tech areas (28.1 percent compared with 33.3 percent for renters), and less likely to live in areas with strict development restrictions (54.9 percent compared with 63.4 percent for renters). Owners are more likely to be white (71.3 percent compared with 47.6 percent for renters) and to be married (60.7 percent compared with 27.8 percent for renters). Owners are also more likely to have a higher education (58 percent with at least some college versus 49 percent for renters) and less likely to live outside central cities than renters do (43.0 percent compared with 65.2 percent). These differences suggest an estimation of two regressions (one for owners and one for renters) rather than one combining both forms of tenure.

The results of the logistic regression for all households are presented in table 6. The results are consistent with expectations. Regardless of tenure, the presence of a high-tech economy contributes significantly to the incidence of critical housing problems, even after controlling for other metro-level factors such as overall employment growth and the presence of development restrictions. Other things being equal, the odds of having a critical housing need for owners who live in top-ranked high-tech areas are nearly 1.4 times the odds of other owners.

After controlling for the high-tech economy and other variables, we find that overall employment growth reduces the average risk of critical housing needs for owners. Each 1 percent increase in employment growth leads to a reduction of approximately 2 percent in the odds of critical housing needs. This suggests that the impact of high-tech growth may be over and above the impact of overall economic growth.

Strict Building Code Enforcement, our proxy for development restrictions, worsens the incidence of problems for owners. Owners in areas with strict building code enforcement have nearly 30 percent greater odds of experiencing critical problems. This finding is consistent with the premises of the conceptual model described earlier. The household- and respondent-level control variables have the expected sign and significance for the incidence of problems among owners.

Table 5. Descriptive Statistics for Variables in Logistic Regression, Selected Metropolitan Areas, All Households, United States, 1999

	Renters (N = 6,832)		Owners (N = 9,072)	
	Mean	Standard Deviation	Mean	Standard Deviation
Percent employment change, 1992–97	11.58	9.39	13.17	8.78
Age	41.69	17.37	51.97	16.09
Number of children	0.65	1.03	0.66	0.99
Number of earners	1.22	0.91	1.42	1.02
	Percent		Percent	
Top quartile, number of dot-com firms	33.3		28.1	
2nd quartile, number of dot-com firms	37.1		31.7	
Strict building code enforcement	63.4		54.9	
Receive government assistance	16.6		—	
Race/ethnicity				
Non-Hispanic whites	47.6		71.3	
Black	22.7		12.3	
Hispanic	21.0		10.8	
Other race/ethnicity	8.7		5.6	
Marital status				
Never married	45.1		13.1	
Married	27.8		60.7	
Divorced/separated/widowed	27.1		26.2	
Education				
Less than high school graduate	23.0		14.3	
High school graduate	28.1		27.8	
Some college	24.1		25.0	
College graduate	17.0		20.5	
Postgraduate	7.8		12.5	
Central city	65.2		43.0	

Source: 1999 American Housing Survey (U.S. Bureau of the Census 2001), Burby et al. 2000, Landis and Elmer 2001, U.S. Bureau of the Census 2000, and authors' calculations.

Similarly, other things being equal, renters who live in top-ranked high-tech areas are approximately 1.6 times more likely and renters in the second quartile of high-tech areas are approximately 1.3 times more likely to experience critical housing needs than renters who live in the lower-ranked high-tech cities. These results are consistent with our expectations and suggest that housing market pressures exist for renters in even moderately high-tech metropolitan areas.

Contrary to the findings for owners, neither of the other metro-level control variables has a significant impact on the incidence of critical housing needs among renters. Other findings are consistent with expectations.

Table 6. Logistic Regression Models for Critical Housing Needs of All Households, Selected Metropolitan Areas, by Tenure, United States, 1999

	Renters (N = 6,832)		Owners (N = 9,072)	
	Coefficient	Odds Ratio	Coefficient	Odds Ratio
Constant	-1.431**	—	-1.013**	NA
Top quartile, number of dot-com firms	0.450**	1.57	0.312**	1.37
2nd quartile, number of dot-com firms	0.269**	1.31	0.030	0.97
Percent employment change 1992–97	-0.005	0.99	-0.017**	0.98
Strict building code enforcement	-0.064	0.94	0.243**	1.28
Receive government assistance	-0.030	0.97	NA	NA
Black	0.073	1.08	0.368**	1.44
Hispanic	0.215*	1.24	0.586**	1.80
Other race/ethnicity	0.223*	1.25	0.648**	1.91
Age	0.007**	1.01	-0.007*	0.99
Married	-0.486**	0.62	-0.403**	0.67
Divorced/separated/widowed	-0.054	0.95	0.058	1.06
Number of children	0.164**	1.18	0.076	1.08
Number of earners	-0.682**	0.51	-0.722**	0.49
Less than high school graduate	0.673**	1.96	0.434**	1.54
High school graduate	0.516**	1.68	0.174	1.19
Some college	0.304**	1.36	-0.019	0.98
Postgraduate	0.012	1.01	-0.115	0.89
Central city	0.106	1.11	0.137	1.15
Model chi-square	691**		636**	
<i>df</i>	18		17	
Pseudo <i>R</i> ²	0.087		0.095	

Source: 1999 American Housing Survey (U.S. Bureau of the Census 2001), Burby et al. 2000, Landis and Elmer 2001, U.S. Bureau of the Census 2000, and authors' calculations.

Note: The comparison groups are metropolitan areas with few development restrictions, lower quartiles of metropolitan areas ranked on the number of dot-com firms per 1,000 workers, no government assistance, non-Hispanic whites, never married, college graduate, and suburban/rural.

NA = Not applicable.
p* < 0.05. *p* < 0.01.

Critical housing needs of moderate-income working households

In the above analysis, we examined the impact of a high-tech economy on the incidence of critical housing problems for all households. As reflected in the nonscholarly statements quoted at the beginning of the article, there is a growing perception that housing problems are not just a concern of poor households or families receiving Temporary Assistance for Needy Families. In an earlier study, Stegman, Quercia, and McCarthy (2000) show that many working households also

experience critical housing problems. In this section, we expand this earlier study and re-estimate the logistic regression for moderate-income working households only. Once other factors are controlled for, does high-tech job growth have a particularly significant impact on the critical housing problems of moderate-income working households?

Table 7 shows the descriptive statistics for the variables in the logistic model using the sample of all moderate-income working households. Compared with all households, moderate-income working households tend to be younger, to have more children, and to have more earners in the household. In these households, the respondent is also less likely to be white. It is interesting to note that respondents in moderate-income working households are more likely to have completed high school and to have some college education than the population as a whole. Yet at the same time, they are also less likely to be college graduates or to have postgraduate education than all households.

The results of the logistic regression for moderate-income working households are presented in table 8. The results are consistent with those presented earlier for all households. *Ceteris paribus*, the odds for owners living in the top-ranked high-tech metropolitan areas experiencing critical housing problems are about 1.7 times greater than the odds for owners living elsewhere.

Looking at the metro-level control variables, we again see that, on average, overall employment growth reduces the probability that moderate-income owner households will experience critical housing needs, while strict building code enforcement contributes significantly to the incidence of housing problems. Relative to other similar households, owners who live in areas with strict building code enforcement are nearly twice as likely to experience problems as those who do not.

As before, moderate-income renter households living in top-ranked high-tech areas are approximately twice as likely to have problems and those living in the next-highest-ranked high-tech areas are more than half again as likely to have problems as similar households in the lower-ranked high-tech areas.

Implications for research and policy

We have examined the impact of high-tech growth on the incidence of critical housing problems among all households and among moderate-income working households. We relied primarily on data from the 1999 American Housing Survey (U.S. Bureau of the Census 2001), but also used data from Burby et al. (2000), Landis and Elmer (2001), and the

Table 7. Descriptive Statistics for Variables in Logistic Regression, Selected Metropolitan Areas, Working Households, United States, 1999

	Renters (N = 3,513)		Owners (N = 2,497)	
	Mean	Standard Deviation	Mean	Standard Deviation
Percent employment change, 1992–97	11.89	9.88	13.06	8.71
Age	36.99	12.66	46.03	13.69
Number of children	0.81	1.10	0.98	1.11
Number of earners	1.48	0.74	1.62	0.75
	Percent		Percent	
Top quartile, number of dot-com firms	35.2		28.2	
2nd quartile, number of dot-com firms	35.8		31.5	
Strict building code enforcement	64.0		53.2	
Receive government assistance	11.4		NA	
Race/ethnicity				
Non-Hispanic whites	42.6		56.1	
Black	22.9		16.9	
Hispanic	25.5		18.9	
Other race/ethnicity	9.0		8.1	
Marital status				
Never married	48.3		18.2	
Married	31.3		54.8	
Divorced/separated/widowed	20.4		27.0	
Education				
Less than high school graduate	20.4		18.5	
High school graduate	30.4		34.3	
Some college	26.1		26.1	
College graduate	16.6		15.7	
Postgraduate	6.5		5.5	
Central city	64.8		46.2	

Source: 1999 American Housing Survey (U.S. Bureau of the Census 2001), Burby et al. 2000, Landis and Elmer 2001, U.S. Bureau of the Census 2000, and authors' calculations.

Note: NA = Not applicable.

State of the Cities 2000 (HUD 2000a). The present study built on and expanded an earlier work by the authors on the 1997 housing problems of moderate-income working households (Stegman, Quercia, and McCarthy 2000). We updated this earlier work by using 1999 data and expanded it by using logistic regression to capture the relative impact of contributors—especially a high-tech economy—to critical housing problems.

Overall, we found that high-tech development affects, positively and significantly, the incidence of critical housing problems for all households and for moderate-income working households, regardless of tenure.

Table 8. Logistic Regression Models for Critical Housing Needs of Moderate-Income Working Households, Selected Metropolitan Areas, by Tenure, United States, 1999

	Renters (N = 3,513)		Owners (N = 2,497)	
	Coefficient	Odds Ratio	Coefficient	Odds Ratio
Constant	-2.204**	NA	-0.970**	NA
Top quartile, number of dot-com firms	0.681**	1.98	0.533**	1.70
2nd quartile, number of dot-com firms	0.436**	1.55	-0.066	0.94
Percent employment change, 1992-97	-0.003	1.00	-0.022**	0.98
Strict building code enforcement	0.054	1.06	0.638**	1.89
Receive government assistance	0.433**	1.54	NA	NA
Black	-0.163	0.85	-0.159	0.85
Hispanic	0.146	1.16	0.130	1.14
Other race/ethnicity	0.104	1.11	0.312	1.37
Age	0.001	1.00	-0.013*	0.99
Married	-0.372**	0.68	0.105	1.11
Divorced/separated/widowed	-0.135	0.87	0.108	1.11
Number of children	0.085	1.09	-0.056	0.95
Number of earners	-0.026	0.97	-0.301**	0.74
Less than high school graduate	-0.240	0.79	-0.075	0.93
High school graduate	-0.083	0.92	-0.358*	0.70
Some college	-0.277	0.76	-0.482**	0.62
Postgraduate	0.273	1.31	0.243	1.28
Central city	0.219	1.25	0.273*	1.31
Model chi-square	76**		129**	
<i>df</i>	18		17	
Pseudo <i>R</i> ²	0.025		0.063	

Source: 1999 American Housing Survey (U.S. Bureau of the Census 2001), Burby et al. 2000, Landis and Elmer 2001, U.S. Bureau of the Census 2000, and authors' calculations.

Note: The comparison groups are metropolitan areas with few development restrictions, metropolitan areas middle and high ranked on high-tech as a percentage of new jobs, no government assistance, non-Hispanic whites, never married, college graduate, and suburban/rural. NA = Not applicable.

p* < 0.05. *p* < 0.01.

Consistent with anecdotal information about the problems of working families, we found the impact of a high-tech economy to be greater for moderate-income working households than for all households.

We caution that our results are preliminary. To our knowledge, this is one of the first studies to examine housing problems and their relationship to high-tech growth, while at the same time trying to control for other factors, such as overall economic growth and development restrictions in the metropolitan area, that might affect the incidence of housing problems. Future work needs to corroborate these findings with expanded methodologies and data.

Three issues are noteworthy. First, further work needs to be done on defining and measuring the new economy. Second, preferably using longitudinal data, we need to corroborate one of our study findings and better understand how the new economy has affected housing markets, over and above the effects of overall economic growth. Third, critical housing problems are local and thus should be studied locally. Thus, following Stegman, Quercia, and McCarthy (2000), the present study needs to be replicated at the metropolitan level using the American Housing Survey metropolitan files.

Consistent with Stegman, Quercia, and McCarthy (2000), we emphasize that policy must strive to meet the housing needs of moderate- and middle-income working households and not just the very poor. This is particularly the case in areas experiencing high-tech growth. Metropolitan areas promoting high-tech growth would do well to put in place housing programs to address the likely impact of such a policy on moderate-income working households that still earn their living in old economy jobs. In areas experiencing rapid growth, these households, including teachers, police officers, firefighters, and other workers central to sustaining our communities, are likely to earn lower wages and have incomes that lag behind rising housing prices.

*Appendix**List of the metropolitan areas included in the study*

Akron, OH	Milwaukee, WI
Austin, TX	Minneapolis, MN
Baltimore, MD	New Orleans, LA
Boston, MA	New York, NY
Chicago, IL	Oakland, CA
Cincinnati, OH	Philadelphia, PA
Cleveland, OH	Phoenix, AZ
Columbus, OH	Riverside–San Bernardino, CA
Dallas, TX	Sacramento, CA
Detroit, MI	Salt Lake City, UT
Fort Worth, TX	San Antonio, TX
Houston, TX	San Diego, CA
Indianapolis, IN	San Francisco, CA
Jacksonville, FL	San Jose, CA
Las Vegas, NV	Seattle, WA
Los Angeles, CA	Tacoma, WA
Miami, FL	Tampa–St. Petersburg, FL

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