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

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# **PROGRAM ON HOUSING AND URBAN POLICY**

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### **DOES A HIGH TECH BOOM WORSEN HOUSING PROBLEMS FOR WORKING FAMILIES?**

By

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

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The authors would like to acknowledge their intellectual debt to George W. McCarthy for earlier research that developed and measured many of the concepts used in this paper.

## ABSTRACT

In this study, we present an analysis of the impacts of high tech economic growth on the incidence of critical housing problems among all households and among moderate-income working families in major metropolitan areas. We rely on data from the 1999 American Housing Survey, supplemented with data from the State of the Cities 2000, Landis and Elmer (2001), and Burby et al. (2000).

Overall, we found that the level of high tech activity impacts, positively and significantly, the incidence of critical housing problems for all households and for moderate-income working households, regardless of tenure. Consistent with anecdotal information about the problems of working families, we found stronger impacts 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 dealing with problems arising from rapid economic growth.

## INTRODUCTION

Over the last two decades, a “new economy” has emerged in the United States. Despite being commonly used by the mainstream media, the term “new economy” lacks a clear definition. One reason for this lack of a clear definition is that the outward signs of the new economy are also the causes of it (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 activities of businesses in a global economy characterized by speed, flexibility, innovation, and new organizational models. This type of activities have been also labeled “network economy,” “digital economy,” “knowledge economy”, and the “risk society.” (Progressive Policy Institute 2001)

This new economy has fueled the economic expansion of the last few years and made wealth accessible to many. Unfortunately, there is increasingly 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.” (HUD 2000b).

“...in 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.” (Washington Post 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” (Ladner 2000, A1, Washington Post).

Shortage of affordable housing has reached extreme proportions in some new economy areas. For instance, 34 percent of the homeless population in Santa Clara County (CA) in 1999, estimated at 20,000, have 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).

Two central factors determine the availability of affordable housing: adequate incomes and sufficient supply of affordable housing. Unfortunately, local press accounts, planning studies and other such reports suggest that the new economy may have negative impacts on both 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 they 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 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, 253). In the 1990s, earnings at the bottom fifth grew less than 1 percent but jumped 15 percent for the top fifth (Walsh 2000, A1). In all likelihood, with the new economy, income shifted toward the more highly skilled because employers pay more for their services (Murphy 2000, 258).

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). 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 last 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. Census 1999). 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 that is affordable to very low-income households

are significantly lower than in non high-tech metropolitan areas (Nelson 2001, this volume).

The popular media has expressed fears that the new economy bubble may have burst recently (Johnson 2001). However, the trends that characterized the new economy are likely to remain. The importance of globalization, new technologies, innovation, and the ongoing move towards a service economy will continue. 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, non-technical servicing jobs may not see such gains (Brinsley 1999).

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

Despite growing evidence, there is still a lack of rigorous understanding about how variables such as the type of jobs created, wage levels paid, population trends and the ability of the industry to supply housing impact the low-income housing needs in a community. The purpose of this study is to examine the relationship between one aspect of the new economy (growth in "dotcom" firms) and the incidence of critical housing



problems among all households and among low- and moderate-income working households.

The remainder of this paper is divided into five sections. In the next section, we 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 sections 4 and 5, we discuss the empirical findings. 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 urban housing market. Consistent with Rothenberg et al. (1991), we consider an urban housing market to be a segmented, interconnected array of housing quality sub-markets. For simplicity of presentation, we assume three quality sub-markets (low, medium, and high). We omit distinctions between owners and renter-occupied units.

Initially, all sub-markets can be assumed to be in general equilibrium. This is specified by the original market period demand and supply functions as 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 employment related to high tech or new economy employment.

(Figure 1 around here)

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 sub-market. This is reflected in the shift of  $D_{H1}$  to  $D_{H2}$  in Fig. 1 and a decrease in the demand in the middle sub-market from  $D_{M1}$  to  $D_{M2}$ . Increased demand will raise valuations in the high sub-market (from  $MV_{H1}$  to  $MV_{H2}$ ). As a result of higher market valuations, property owners in the middle sub-market will upgrade units to the high submarket to capture higher returns. This is reflected in the shift from  $S_{M1}$  to  $S_{M2}$  in the middle sub-market and from  $S_{H1}$  to  $S_{H2}$  in the high sub-market. With increased supply in the high sub-market, 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 the original levels ( $MV_{H3} > MV_{H2}$ ).

In contrast, market valuations and rates of return to owners in the middle sub-market 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 sub-market households moving to higher quality housing. As a result of initial lower market valuations in the middle sub-market, the more affluent low sub-market households are likely to move to that destination ( $D_{L1}$  to  $D_{L2}$  and  $D_{M2}$  to  $D_{M3}$ ). In the low sub-market, a decrease in the supply of housing ( $S_{L1}$  to  $S_{L2}$ ), upgraded to the middle sub-market, is likely to result from the decrease in demand ( $D_{L1}$  to  $D_{L2}$ ).

it is possible that sub-market 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 this conditions do not take place, market valuations are likely to be higher than 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 sub-market 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, there are several factors likely to affect market valuations in general and households' affordability levels in particular. These include 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 due to increased supply. However, if the economy continues to expand over a longer period of time (e.g., 1992-2000), the rates of return from continuing to supply housing to the lower quality sub-markets are likely to diminish in relative terms. Prospectively, relative returns will be higher from serving the higher sub-markets, via new construction, upgrading, converting units to non-residential uses, or demolishing the structures and replacing them with higher quality, more intensive residential uses. The resulting higher market

valuations will worsen affordability problems of most households, regardless of sub-market.

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 2000a).

In metropolitan areas, where the competition for central city land by high-income households and nonresidential users have grown most intense, the loss of lower quality stock to alternative uses is likely to be most severe. This may be the case in urban areas with development restrictions, whether through 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 dramatic impacts on prices. For instance, in Portland OR, the instant land is moved inside Portland’s urban growth boundary, its value goes 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 sub-markets 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 forced to spend more of their income on housing and/or settle for less adequate housing. The available evidence cited above suggests that price pressures are greater in high tech areas, while wage growth in many “old economy” jobs is declining, in either real or inflation-adjusted terms. Therefore, in the short run, high tech economic growth is expected to lead to an increase in the incidence of critical housing problems. Moreover, given that high tech growth appears to exacerbate income inequality, high tech growth may impact 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 study and beyond the limits of the data we have available. However we do include proxies for these factors and control for household characteristics that may impact housing problems in our statistical analysis.

## 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 impact, in the short run market period, the affordability problems of households.

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

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

- Where  $\ln [P(CHN)_i / (1 - P(CHN)_i)]$  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 the U.S. Department of Housing and Urban Development (HUD) in defining “worst case” needs, although HUD restricts its analysis to unassisted very low-income renters (HUD 2000c). This variable is calculated using data from the 1999 American Housing Survey.

- 1<sup>st</sup> Quartile Dotcom Firms and 2<sup>nd</sup> Quartile Dotcom Firms are dummy variables indicating whether a metropolitan area is in the top or second quartile of a measure of the number of “dotcom” firms per 1,000 employees in 1998 (see Landis & Elmer 2001 in this volume).
- Percentage Employment Change 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 State of the Cities 2000.
- Strict Building Code Enforcement is a dummy variable indicating whether a metropolitan area strictly enforces building codes (see Burby et al 1998 and 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 (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.
- $\beta_0, \beta_1, \beta_2,$  etc. are fixed regression coefficients;  $\mu_i$  is an error term with a logistic distribution.

We estimated this model separately for owners and renters, and we estimated it for the general population and for moderate-income working households. Moderate-income working households are defined following Stegman et al. (2000). Moderate-income working households include households who 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). The data were collected using a search engine for domain names on the Internet. The data exist 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 compared the performance of numerous high-tech indicators and found this measure to work best. The indicator performed similarly well in the analyses for this paper, and using the same variable allows readers to compare the two papers.

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, due to growth in the overall economy. To address this question given data availability, we have included the percentage growth in overall employment between 1992 and 1997 as a proxy for overall economic growth.

Of all the control variables, the presence and type of development restrictions may be the most interesting because of its implicit treatment in the literature (Rothenberg et al. 1991). Burby et al (2000 and 1998) 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 et al: the strictness of the building code enforcement in central cities. This variable is derived from a factor analysis that compared 155 cities in terms of 5 measures. These include: 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 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 latter two measures listed above). The variable used in the regression model (labeled “strict building code enforcement”) is a dummy variable 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 may impact 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 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, in results not reported here, we also examined 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 “dotcom” firms and employment change 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. A list of the 34 metropolitan areas included in the study is in Appendix A.

Weighted logistic regression models were estimated using Stata. Unweighted regressions (not reported) were also estimated without substantial differences in model results.

#### CRITICAL HOUSING NEEDS OF ALL HOUSEHOLDS

In 1999, there were 13.7 million households with critical housing needs (CHN) (Table 1). Approximately, this represents a five percent increase in the incidence of critical housing needs since 1997. This is noteworthy because HUD actually reports a decrease in the number of “worst-case” needs between 1997 to 1999 (HUD 2000a).

In 1999, about 3.7 million households with critical housing problems were elderly households. Another 3.1 million were unemployed and/or dependent 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.

(Table 1 around here)

Critical housing needs are primarily the result of severe cost burden (household spends more than half its income on housing) rather than severe inadequacy. Of the 13.7 million households with CHN, 11.7 million have severe cost burdens only, 1.7 million are severely inadequate only, and 0.4 million have both problems (differences due to rounding error). It's 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.

The incidence of critical housing problems varies dramatically by tenure, ethnic/racial groups, and location (Table 2). Across all categories, renters are more likely to experience problems than owners, often nearly twice as likely. Critical housing problems also vary from place to place. For both renters and owners, the incidence of problems is greater in the Northeast and West regions, followed by the Midwest and South regions. 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. As a rule, Hispanics are less likely to have critical housing problems than Blacks, regardless of region or tenure. (Table 2 around here)

Critical housing problems are not confined to the nation's cities. In fact, most households with critical housing problems live in suburban and non-metropolitan areas (Table 3). About 5.6 million households with problems live in central cities in 1999, compared with 5.4 million in the suburbs and 2.9 million in non-metro areas. Renters are more likely than owners to have problems, if they live in central city or suburban locations. The reverse is true in non-metropolitan areas. In the later areas, more than 2.1 million

owners have critical problems compared with 756,000 renters. These patterns are consistent with those estimated by Stegman et al. (2000) using 1997 AHS data. Critical housing problems are increasingly moving to suburban and non-metropolitan areas, following most of the country's population and employment growth.

(Table 3 around here)

Consistent with the premises of the conceptual model above, critical housing problems appear to be worst in areas that have 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 1000 workers 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 is 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 2<sup>nd</sup> quartile exhibit much higher rates of critical housing needs than do renters in lower-ranked areas, while we do not see this for owners.

(Table 4 around here)

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 variable (0/1) that captures whether a household has critical housing needs. Descriptive statistics of the variables included in the model are presented in (Table 5). Owners and renters appear to be two distinct populations. Owners are more likely to be older (52 compared with 42 years old), and to have more earners in the households than renters do (1.42 compared with 1.22 earners). Moreover, owners are more likely to live in areas with slightly higher overall employment growth (mean metropolitan area employment growth of 13.2 for owners vs. 11.6 for renters), less likely to live in top-ranked high tech areas (28.1 compared with 33.3 percent for renters), and less likely to live in areas with strict development restrictions (54.9 compared with 63.4 percent for renters). Owners are more likely to be white (71.3 compared with 47.6 percent for renters) and to be married (60.7 compared with 27.8 percent for renters). Owners are also more likely to have a higher education (58 percent with at least some college vs. 49% for renters) and less likely to live outside central cities than renters do (43.5 compared with 65.4 percent). These differences suggest an estimation of two regressions (one for owners and one for renters) rather than one combining both tenure forms.

(Table 5 around here)

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 significantly contributes 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. Others things equal, the odds of having a critical

housing need for owners that live in top ranked high tech areas are nearly 1.4 times the odds of other owners.

(Table 6 around here)

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 in employment growth leads to an approximately 2 percent reduction in the odds of CHN. This suggests that the impact of high tech growth may be over and above the impacts 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 describe above. The household- and respondent-level control variables have the expected sign and significance on the incidence of problems among owners.

Similarly, other things equal, renters that live in top ranked high tech areas are approximately 1.6 times as likely, and renters in the 2<sup>nd</sup> quartile of high tech areas are approximately 1.3 times as 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 have a significant impact on the incidence of critical housing needs among renters. Other findings are consistent with expectations.

#### CRITICAL HOUSING NEEDS OF MODERATE-INCOME WORKING HOUSEHOLDS

In the analysis above, we examined the impact of a high tech economy on the incidence of critical housing problems of all households. As reflected in the non-scholarly statements quoted earlier in the paper, there is a growing perception that housing problems are not just a concern of poor households or families on Temporary Assistance for Needy Families (TANF). In an earlier study, Stegman et al. (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 households. In these households, the respondent is also less likely to be white. Interestingly, 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 a college graduate or to have post graduate education than all households.

(Table 7 around here)

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 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 of moderate-income owner households experiencing critical housing needs while strict building code enforcement significantly contributes 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 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, than similar households in the lower-ranked high tech areas.

(Table 8 around here)

#### IMPLICATIONS FOR RESEARCH AND POLICY

In this study, we examined the impacts of high tech growth on the incidence of critical housing problems among all households and among moderate-income working households. Primarily, we relied on data from the 1999 American Housing Survey, but also used data from the State of the Cities 2000, Landis and Elmer (2001), and Burby et al. 2000. This study built and expanded on an earlier work by the authors (Stegman et al. 2000) on the 1997 housing problems of moderate-income working households. We

updated this earlier study using 1999 data and expanded it by using logistic regression to capture the relative impacts of contributors to critical housing problems, most importantly the impact of a high-tech economy.

Overall, we found that high tech development impacts, positively and significantly, the incidence of critical housing problems of all households and of moderate-income working households, regardless of tenure. 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 the above results are preliminary in nature. To our knowledge, this is one of the first studies to examine housing problems and their relation to high tech growth, while trying to control for other aspects of the metropolitan area, such as overall economic growth and development restrictions, that might impact on the incidence of housing problems. Future work needs to corroborate the study 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 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 in nature and thus should be studied locally. Thus, following Stegman et al. (2000), the present study needs to be replicated at the metropolitan level using the AHS metro files.

Consistent with Stegman et al. (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. Particularly, this is 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 impacts on moderate-income working households that still earn their livings in old economy type jobs. These households are likely to earn lower wages and incomes that lag rising housing prices in areas experiencing rapid growth. These include teachers, police officers, firefighters, and others workers central to sustaining our communities.

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## Appendix A

### List of the Metropolitan Areas Included in the Study

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

**TABLE 1**  
Working Status of Households with Critical Housing Needs, US, 1997 and 1999  
(000's)

	1999		1997	
	Number	Percent	Number	Percent
Elderly, Not Working	3,683	26.8	3,753	27.5
Non-Elderly, Not Working	3,118	22.7	3,531	25.8
Marginally Employed <sup>a</sup>	2,522	18.3	2,939	21.5
Moderate Income Working Households <sup>b</sup>	3,747	27.3	3,046	22.3
High Income Households <sup>c</sup>	673	4.9	398	2.9
<b>Total<sup>d</sup></b>	13,743	100.0	13,677	100.0
<b>As Percent of all US Households</b>		12.0		12.2

<sup>a</sup> Marginally Employed include households with earnings from wages between \$2,675 and \$10,700 (¼ to full-time minimum wage). “Not Working” is defined as wages less than ¼ time minimum wage.

<sup>b</sup> Moderate Income are households whose total income is between \$10,700 and 120 percent of area median income, and where wage earnings account for at least half the total household income.

<sup>c</sup> High Income are households whose total income exceeds 120 percent of area median income, regardless of income sources.

<sup>d</sup> The reported categories are not exhaustive of all households. For example, households whose total income falls between \$10,700 and 120 percent of 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 characteristics of all households.

Source: 1997 and 1999 American Housing Surveys and authors' calculations

**TABLE 2**  
 Incidence of Critical Housing Needs,  
 by Race, Ethnicity, Tenure, and Region, US, 1999  
 (Percents)

	Northeast	Midwest	South	West	Total US
<b>Non-Hispanic Whites</b>					
<i>Renters</i>	21.1	17.7	16.2	19.4	18.4
<i>Owners</i>	10.3	7.2	8.0	10.8	8.8
<b>Non-Hispanic Blacks</b>					
<i>Renters</i>	27.8	27.2	27.1	28.3	27.4
<i>Owners</i>	17.0	15.2	12.1	15.6	13.6
<b>Hispanics</b>					
<i>Renters</i>	28.7	22.8	18.3	26.2	24.2
<i>Owners</i>	16.0	8.1	12.2	15.8	13.6
<b>All Households</b>	14.2	10.1	10.7	14.3	12.0

Source: 1999 American Housing Surveys and authors' calculations

**TABLE 3**  
 Metropolitan Location of Households with  
 Critical Housing Needs, by Tenure, US, 1999  
 (Numbers in 000's)

	<u>Central City</u>	<u>Suburbs</u>	<u>Non-Metro</u>	<u>Total</u>
<b>All Households</b>				
<i>Renters</i>	3,757 (52.1)	2,697 (37.4)	756 (10.5)	7,209 (100)
<i>Owners</i>	1,789 (27.1)	2,680 (40.7)	2,121 (32.2)	6,590 (100)
<b><i>Total<sup>a</sup></i></b>	<u>5,546 (40.2)</u>	<u>5,377 (39.0)</u>	<u>2,877 (20.9)</u>	<u>13,800 (100)</u>
<b>Working Families</b>				
<i>Renters</i>	1,068 (55.2)	702 (36.3)	165 (8.5)	1,936 (100)
<i>Owners</i>	553 (30.5)	803 (44.3)	455 (25.1)	1,811 (100)
<b><i>Total</i></b>	<u>1,621 (43.3)</u>	<u>1,506 (40.2)</u>	<u>620 (16.5)</u>	<u>3,747 (100)</u>

<sup>a</sup> The total of 13,800,000 includes the 57,000 households with critical housing needs with “other” working status (see Table 1, note d)

Source: 1997 and 1999 American Housing Surveys and authors' calculations  
 Numbers in parentheses are row percentages.



**TABLE 4**  
 Incidence of Critical Housing Needs for All Households  
 in Selected Metropolitan Areas by High-Tech Status and Tenure, US, 1999  
 (Percents)

Tenure Status	% with CHN
Renters (N=8,110)	
# of Dotcom Firms per 1,000 Workers, 1998	
<i>Ranked in Top Quartile (N=2,832)</i>	25.5
<i>Ranked in 2<sup>nd</sup> Quartile (N=2,524)</i>	24.1
<i>Ranked in 3<sup>rd</sup> Quartile (N=1,750)</i>	19.9
<i>Ranked in Bottom Quartile (N=1,004)</i>	19.9
Owners (N=11,237)	
# of Dotcom Firms per 1,000 Workers, 1998	
<i>Ranked in Top Quartile (N=3,023)</i>	15.4
<i>Ranked in 2<sup>nd</sup> Quartile (N=3,263)</i>	10.8
<i>Ranked in 3<sup>rd</sup> Quartile (N=2,740)</i>	11.1
<i>Ranked in Bottom Quartile (N=2,211)</i>	8.6
All Households (N=19,347)	
# of Dotcom Firms per 1,000 Workers, 1998	
<i>Ranked in Top Quartile (N=5,855)</i>	20.2
<i>Ranked in 2<sup>nd</sup> Quartile (N=5,787)</i>	17.3
<i>Ranked in 3<sup>rd</sup> Quartile (N=4,490)</i>	14.5
<i>Ranked in Bottom Quartile (N=3,215)</i>	12.5
Number of Metropolitan Areas	38

Source: 1999 American Housing Survey, Burby et al 2000, Landis & Elmer 2001, and authors' calculations.

Percentages are based on weighted frequencies.

**TABLE 5**  
Descriptive Statistics for Variables in Logistic Regression,  
Selected Metropolitan Areas, All Households, US, 1999

	<b>Renters</b> (N=6,832)		<b>Owners</b> (N=9,072)	
	Mean	S.D.	Mean	S.D.
% Employment Change 1992-1997	11.58	9.39	13.17	8.78
Age	41.69	17.37	51.97	16.09
Number of Children	.65	1.03	.66	.99
Number of Earners	1.22	.91	1.42	1.02

	<b>Renters</b> (N=6,832)	<b>Owners</b> (N=9,072)
	Percent	Percent
Top Quartile # Dotcom Firms	33.3	28.1
2 <sup>nd</sup> Quartile # Dotcom 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
African-American	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 Grad	23.0	14.3
High School Grad	28.1	27.8
Some College	24.1	25.0
College Grad	17.0	20.5
Post-Graduate	7.8	12.5
Central City	65.2	43.0

Source: 1999 American Housing Survey, Census 2000, Burby et al 2000, Landis & Elmer 2001, and authors' calculations

**Table 6**  
 Logistic Regression Models for Critical Housing Needs  
 Of All Households,  
 Selected Metropolitan Areas, By Tenure, US, 1999

	<b>Renters</b>		<b>Owners</b>	
	(N=6,832)		(N=9,072)	
	Coefficient	Odds Ratio	Coefficient	Odds Ratio
Constant	-1.431**	---	-1.013**	---
Top Quartile # Dotcom Firms	.450**	1.57	.312**	1.37
2 <sup>nd</sup> Quartile # Dotcom Firms	.269**	1.31	.030	.97
% Employment Change 1992-1997	-.005	.99	-.017**	.98
Strict Building Code Enforcement	-.064	.94	.243**	1.28
Receive Government Assistance	-.030	.97	--	--
African-American	.073	1.08	.368**	1.44
Hispanic	.215*	1.24	.586**	1.80
Other Race/Ethnicity	.223*	1.25	.648**	1.91
Age	.007**	1.01	-.007*	.99
Married	-.486**	.62	-.403**	.67
Divorced/Separated/Widowed	-.054	.95	.058	1.06
Number of Children	.164**	1.18	.076	1.08
Number of Earners	-.682**	.51	-.722**	.49
Less Than High School Grad	.673**	1.96	.434**	1.54
High School Grad	.516**	1.68	.174	1.19
Some College	.304**	1.36	-.019	.98
Post-Graduate	.012	1.01	-.115	.89
Central City	.106	1.11	.137	1.15
Model chi-square		691**		636**
Df		18		17
Pseudo R <sup>2</sup>		.087		.095

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

\* -- p<.05  
 \*\*-- p<.01

Source: 1999 American Housing Survey, Census 2000, Burby et al 2000, Landis & Elmer 2001, and authors' calculations

**TABLE 7**  
 Descriptive Statistics for Variables in Logistic Regression,  
 Selected Metropolitan Areas, Working Households, US, 1999

	<b>Renters</b> (N=3,513)		<b>Owners</b> (N=2,497)	
	Mean	S.D.	Mean	S.D.
% Employment Change 1992-1997	11.89	9.88	13.06	8.71
Age	36.99	12.66	46.03	13.69
Number of Children	.81	1.10	.98	1.11
Number of Earners	1.48	.74	1.62	.75

	<b>Renters</b> (N=3,513)	<b>Owners</b> (N=2,497)
	Percent	Percent
Top Quartile # Dotcom Firms	35.2	28.2
2 <sup>nd</sup> Quartile # Dotcom Firms	35.8	31.5
Strict Building Code Enforcement	64.0	53.2
Receive Government Assistance	11.4	--
Race/Ethnicity		
Non-Hispanic Whites	42.6	56.1
African-American	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 Grad	20.4	18.5
High School Grad	30.4	34.3
Some College	26.1	26.1
College Grad	16.6	15.7
Post-Graduate	6.5	5.5
Central City	64.8	46.2

Source: 1999 American Housing Survey, Census 2000, Burby et al 2000, Landis & Elmer 2001, and authors' calculations

**Table 8**  
 Logistic Regression Models for Critical Housing Needs  
 Of Moderate-Income Working Households,  
 Selected Metropolitan Areas, By Tenure, US, 1999

	<b>Renters</b>		<b>Owners</b>	
	(N=3,513)		(N=2,497)	
	Coefficient	Odds Ratio	Coefficient	Odds Ratio
Constant	-2.204**	---	-.970**	---
Top Quartile # Dotcom Firms	.681**	1.98	.533**	1.70
2 <sup>nd</sup> Quartile # Dotcom Firms	.436**	1.55	-.066	.94
% Employment Change 1992-1997	-.003	1.00	-.022**	.98
Strict Building Code Enforcement	.054	1.06	.638**	1.89
Receive Government Assistance	.433**	1.54	--	--
African-American	-.163	.85	-.159	.85
Hispanic	.146	1.16	.130	1.14
Other Race/Ethnicity	.104	1.11	.312	1.37
Age	.001	1.00	-.013*	.99
Married	-.372**	.68	.105	1.11
Divorced/Separated/Widowed	-.135	.87	.108	1.11
Number of Children	.085	1.09	-.056	.95
Number of Earners	-.026	.97	-.301**	.74
Less Than High School Grad	-.240	.79	-.075	.93
High School Grad	-.083	.92	-.358*	.70
Some College	-.277	.76	-.482**	.62
Post-Graduate	.273	1.31	.243	1.28
Central City	.219	1.25	.273*	1.31
Model chi-square		76**		129**
Df		18		17
Pseudo R <sup>2</sup>		.025		.063

Note: The comparison groups are metropolitan areas with low development restrictions, middle and high-ranked metropolitan areas on high-tech as percent of new jobs, received no government assistance, non-Hispanic whites, never married, college graduate, and suburban/rural.

\* -- p<.05

\*\*-- p<.01

Source: 1999 American Housing Survey, Census 2000, Burby et al 2000, Landis & Elmer 2001, and authors' calculations

FIGURE 1: SUBMARKET ADJUSTMENTS TO RAPID HIGH TECH GROWTH

