

Urban Homeowners Insurance Markets in Texas: A Search for Redlining

November 1999

**Martin F. Grace, Ph.D.
Robert W. Klein, Ph.D.**
**Center for Risk Management and Insurance Research
Georgia State University
P.O. Box 4036
Atlanta, Georgia 30302-4036
Tel: 404-651-4250
Fax: 404-651-1897
E-Mail: rwklein@gsu.edu**

The authors express their appreciation to State Farm Insurance Companies for providing funding for this study. Scott Harrington and Richard Phillips provided helpful advice. The opinions expressed in this paper are solely those of the authors and do not necessarily represent the views of State Farm or Georgia State University. This paper draws from a Center for RMI Research Report 99-2 entitled *An Analysis of Urban Homeowners Insurance Markets In Texas*.

Urban Homeowners Insurance Markets in Texas: A Search for Redlining

Abstract

There has been a continuing debate in Texas and other states about the availability and cost of home insurance to residents of inner city and minority neighborhoods. Consumer and community advocates contend that insurers engage in redlining or unfair discrimination against minority areas by charging excessive prices and limiting the supply of insurance. Unfortunately, insurance redlining allegations have been largely based on simplistic analyses that suffer from serious methodological flaws. In this paper, we build on a more rigorous vein of research by utilizing econometric analysis to identify measurable factors that affect urban homeowners insurance markets. While this study cannot conclusively prove or disprove the presence and negative impact of unfair discrimination, it assesses whether there is significant statistical evidence of such behavior. We conclude that there is no statistical evidence of redlining and that the risk of loss and the demand for insurance primarily drive the terms of insurance transactions. This implies that measures directed towards enhancing safety and bettering economic conditions offer the best prospects for improving urban insurance markets.

Introduction

Problems with the availability and cost of home insurance in urban communities and allegations of industry “redlining” practices have received considerable political attention and generated an intense policy debate. This debate has a 40-year history and has progressed as urban communities and industry practices have evolved. Charges of explicit racial discrimination have changed to allegations of implicit unfair discrimination against minority areas caused by certain industry marketing, pricing and underwriting practices. There was a resurgence of these allegations after the Los Angeles civil disturbance in 1992, prompting investigations by state and federal governments and other organizations.¹ In Texas, consumer organizations and the insurance department have conducted studies on urban auto and home

¹ The NAIC initiated a study of urban insurance markets in 1992, which was completed in 1996. See NAIC (1996) for the findings of the NAIC study and its recommendations. The NAIC report also summarizes other studies and actions taken by states and the federal government.

insurance and offered recommendations on remedial measures (see, for example, Center for Economic Justice, 1997a and 1997b).

Community and consumer advocates contend that insurers' underwriting practices and pricing systems unfairly discriminate against neighborhoods with older and low-value homes, resulting in excessive rates and diminished availability of coverage. The fact that alleged under-served areas tend to have high-minority populations leads to charges of racial as well as geographic discrimination.² Industry critics call for strong legal and regulatory measures as well as voluntary efforts by insurers to correct this situation (Squires, 1997).³ Insurers respond that risk and other economic factors account for higher rates and coverage limitations in urban areas and that remedial efforts should focus on improving economic and safety conditions (Duncan, 1995).

This is a difficult issue to resolve because of the complexity of urban insurance markets. Higher rates and more limited coverage in the inner city could be caused by a number of factors, including: greater risk; substandard housing; low income; costly information and other barriers to market entry; and regulatory constraints, among others. Unfair discrimination is alleged to be a significant factor by some and refuted by others. In addition, certain industry underwriting and marketing practices, justified from a business

² There are similar allegations of unfair racial/geographic discrimination in the housing and lending industries, as well as auto insurance. Lending institutions are subject to federal laws mandating service to urban areas and requiring reports on the disposition of loan applications by the race of applicants. Community and consumer advocates have argued that insurers selling home insurance should be subject to the same type of requirements.

³ Insurers have been subject to a number of redlining lawsuits, which have been settled out of court or are still in litigation. One exception is *Housing Opportunities Made Equal (HOME) v. Nationwide Insurance Companies*, in which a jury decided in favor of the plaintiffs and awarded them \$500,000 in compensatory damages and \$100 million in punitive damages. This decision is currently under appeal to the Supreme Court of Virginia. Several states and the U.S. Department of Housing and Urban Development and the U.S. Department of Justice have taken various actions to address alleged insurance redlining and urban insurance problems. The legal issues involved with insurance redlining cases and government sanctions are beyond the scope of this paper, but have been debated in various articles. See Squires (1997) for a historical summary of anti-redlining actions and a

perspective, may still have a negative effect on urban communities because of these areas' particular economic characteristics. The true nature and causes of urban insurance problems have important implications for the types of remedies that are warranted and likely to be most successful.

Prior research falls short in providing an adequate understanding of urban homeowners insurance markets or a satisfactory basis on which to recommend appropriate remedies. Previous analyses of urban insurance markets in Texas and other states tend to rely on simple statistical comparisons of prices and availability measures across areas differentiated by their racial composition.⁴ This approach confounds the effects of race with other factors that are correlated with race. In other words, the effects attributed to race or unfair discrimination may be partially or wholly explained by other variables related to risk and the demand for insurance. Statisticians and economists call this the “omitted variables” problem. To properly assess the existence and impact of unfair racial/geographic discrimination, it is necessary to control for other factors that affect market outcomes. Recent research (e.g., Harrington and Niehaus, 1998) has progressed in terms of using more rigorous analytical methods and, as it has done so, it has pointed away from unfair discrimination and towards risk and economic factors as the principal causes of urban insurance problems.

In this paper, we build on this research by identifying measurable factors that affect urban homeowners insurance markets in Texas and the direction and relative magnitude of

discussion of proposed legal and regulatory actions to further address perceived unfair industry practices. Duncan (1995) offers a contrasting view on the need and legal foundation for such measures and sanctions.

⁴ See, for example, Council for Economic Justice (1997a and 1997b). Allegations of redlining also have been based on “testing” of insurer/agent responses to inquiries from minority individuals and analyses of agent location (Squires, 1997). As economists have delved into this topic, they have employed more sophisticated statistical methods to ascertain the causes of urban insurance problems (Klein, 1996; Harrington and Niehaus, 1998; and Wissoker, Zimmerman, and Galster (Urban Institute), 1998). As researchers have employed more rigorous methods and richer data, their findings indicate that risk and economic factors are the principal causes of urban insurance problems, rather than unfair discrimination.

their effects.⁵ Texas is the only state that freely provides Zip code level insurance data to researchers. Our measures of market outcomes consist of claim costs, the ratio of losses to premiums (an inverse measure of price) and the type of insurance coverage purchased. Our model includes a number of different explanatory variables that are hypothesized or alleged to affect market performance. These variables include factors associated with the risk of loss, other economic and demographic factors expected to influence the supply and demand for insurance, as well as the racial composition of the population. Our analysis is performed at a Zip code level to assess market conditions within major metropolitan areas in Texas.

While this study cannot conclusively prove or disprove the presence and negative impact of unfair discrimination, i.e., redlining, it assesses whether there is significant statistical evidence of such behavior. Importantly, we control for the measurable factors affecting market conditions in order to isolate the influence of unfair discrimination or race from other variables. This provides a more valid test of the presence and effect of redlining than that provided by simple comparisons of market outcomes between low and high-minority neighborhoods. It also provides insights into the most important factors affecting urban insurance markets and, hence, the remedies that have the best prospects for improving market conditions. Our study extends previous research by conducting the most comprehensive and rigorous analysis of urban homeowners insurance markets performed to date.

We find no statistical evidence that the racial or ethnic composition of neighborhoods plays any measurable role in determining how much homeowners pay for insurance, nor the kind of insurance they purchase. Rather, factors associated with the risk of loss and the

⁵ This paper builds on earlier papers on urban insurance markets in Missouri and Texas by Klein (1996 and 1997). A study of urban auto insurance markets in Missouri by Harrington and Niehaus (1998) also provided

demand for insurance appear to primarily drive the terms of insurance transactions. Among these factors are the presence of low-value homes and geographic variables, such as crime-related claims, which appear to increase claim costs. These findings tend to support the soundness of industry risk classification practices and are consistent with the argument that economic considerations, not irrational bias, determine the supply of insurance to urban areas where minorities are concentrated. Thus, we believe that measures directed towards reducing risk and improving economic conditions constitute the best approach to lower prices and expand the scope of coverage.

The paper is organized as follows. First, we generally describe conditions in urban insurance markets in Texas. We then detail the data and methodology used in our multivariate analysis. This is followed by a presentation and discussion of our empirical results. Finally, we conclude with some observations on the policy implications of our study and where further research might be most fruitful.

General Conditions in Urban Insurance Markets

Differences Between Metropolitan and Non-Metropolitan Areas

Consumer groups and neighborhood advocates complain about the differences in the cost and availability of insurance between urban and non-urban areas and among neighborhoods within a city (Squires, 1997). We provide some basic statistics on insurance prices and costs in Table 1. The table compares data on insurance prices and claim costs in the three largest Texas metropolitan areas with non-metropolitan, i.e., “outstate”, areas in the state

ideas for this paper. Here we confine our analysis to homeowners insurance where data for Texas are most readily available.

for the years 1993-1997.⁶ The Metropolitan Statistical Areas (MSAs) selected were Dallas-Ft. Worth, Houston, and San Antonio. Because these MSAs comprise urban neighborhoods as well as adjoining suburbs, their differences with outstate areas may not be as great as would be observed between more densely populated urban areas and suburban/rural areas.

In Table 1, we compare mean values for: the average premium per insured home and per \$1,000 of insurance coverage; average loss costs per insured home and per \$1,000 of insurance coverage; the frequency of claims per 100 insured homes; the average severity of loss per claim; and the ratio of losses paid to premiums written for homeowners and dwelling fire insurance. The average premium indicates what homeowners typically pay for property insurance, which is alleged to be much higher in urban and inner-city areas. The other variables provide comparative information on the cost of claims, which should be strongly associated with the level of premiums.⁷ The loss ratio shows the claims payments or benefits that insureds receive in relation to the premiums they pay and is a relative measure of fairness and efficiency in insurance pricing. The higher the loss ratio, the less insureds pay in premiums relative to the benefits they receive. Hence, the loss ratio provides some indication of pricing efficiency and fairness.⁸

⁶ These data were obtained from the Texas Department of Insurance and are used throughout our analysis.

⁷ As explained below, insurers base their rates on expected losses. For any given set of policies, however, actual losses may vary from predicted or expected losses. According to the law of large numbers, the larger the pool of exposures and/or the longer the experience period, the more closely actual losses will tend to equal expected losses. Five years of data are used in this analysis to reduce some of the random volatility in actual loss experience.

⁸ It should be noted that premiums would be expected to increase less than proportionately with the amount of insurance because of the effect of certain fixed policy expenses and partial losses. On the other hand, certain administrative expenses may be higher in high-risk areas, which could offset any scale economies. It is difficult to determine the significance of these factors and their implications for comparing loss ratios between areas with different loss cost levels. Small and short-term differences could reflect expense differences and year-to-year volatility in claims. Large and long-term differences in loss ratios could reflect pricing imperfections.

Table 1 confirms that metropolitan residents pay higher average premiums for insurance than do homeowners in non-metropolitan areas for both types of coverage. The average homeowners premium per home in the three MSAs combined was \$815 which was 9 percent higher than the average premium for outstate areas, \$745. Houston was the highest at \$942 (26.4 percent higher than outstate); Dallas-Ft. Worth and San Antonio were \$844 and \$665, respectively. For dwelling fire insurance, the average premium per home was \$397 in the three MSAs combined, compared to \$356 in non-metropolitan areas. For dwelling fire insurance, among the three MSAs, Houston was again the highest with a \$435 average premium, compared with \$411 for Dallas-Ft. Worth and \$360 for San Antonio.

Interestingly, average premiums per \$1,000 of insurance were lower in the MSAs than outstate. For homeowners insurance, Houston was \$8.51, Dallas-Ft. Worth was \$6.88 and San Antonio was \$6.63, compared to \$8.83 for non-metropolitan areas. We see a similar pattern for dwelling fire insurance. This may be caused, in part, by the higher values and amounts of insurance for homes in metropolitan areas. As explained below, premiums increase less than proportionately with the amount of insurance because of partial losses and certain fixed policy costs.

At the same time, the data indicate that disparities in loss costs per home are even greater between these MSAs and non-metropolitan areas than the differences in premiums. The average loss cost per home was 25 percent higher for homeowners' policies in the MSAs than in non-metropolitan areas. The average loss cost per \$1,000 of insurance was roughly equivalent between the MSAs combined and outstate. However, Dallas-Ft. Worth stands out with a \$5.92 average loss cost per \$1,000, which was 21.1 percent higher than outstate.

Houston, on the other hand, with a \$3.51 average loss cost per \$1,000 was 17 percent lower than outstate.

For dwelling fire insurance, the average loss cost per home was 35 percent higher in the MSAs, but only 5 percent higher for the average loss cost per \$1,000 of insurance. Dwelling fire loss costs were also particularly high in Dallas-Ft. Worth and relatively low in Houston.

It should be noted that even with five years of data, the volatility of property insurance claims and losses contributes to some anomalies in the patterns observed. The relatively high loss costs in Dallas-Ft. Worth and the relatively low loss costs in Houston may be caused by the random occurrence of weather-related events, which do not reflect the underlying, long-term risk of loss which determines the rate structure. For example, Houston faces a relatively high level of hurricane risk, but fortunately has not experienced a major storm since 1983.

Because the differences in loss costs are greater than the differences in premiums, the loss ratios for the MSAs were higher than the loss ratios for non-metropolitan areas. The loss ratio in the MSAs was 15 percent higher for homeowners insurance and 23 percent higher for dwelling fire insurance than the loss ratio in non-metropolitan areas. Hence, these data do not indicate that metropolitan areas are being charged excessive premiums in relation to their loss costs. Indeed, the data suggest that metropolitan homeowners overall are receiving a relative bargain in what they pay for insurance given what they receive in claims payments. This is consistent with the pattern observed in other states (Klein, 1996). At the same time, the volatility in loss experience also affects the loss ratio, with Dallas-Ft. Worth experiencing especially high loss ratios and Houston experiencing relatively low loss ratios over the sample time period.

Table 2 provides some indication of the relative availability of insurance, as measured by the proportion of dwelling fire policies purchased in 1997.⁹ This is a crude measure of availability, at best. Although dwelling fire policies typically provide less coverage than homeowners policies, the relative number of dwelling fire policies purchased is affected by both demand and supply conditions. Hence, a higher proportion of dwelling fire policies in urban areas could be caused wholly or in part by consumer preferences or budget constraints rather than limits on the supply of multi-peril coverage. Some consumers may prefer to purchase dwelling fire policies if they are cheaper than the alternative. Also, urban areas have a higher proportion of multi-unit residential structures, resulting in a higher proportion of dwelling fire policies, which are more likely to be used for these structures.¹⁰ Finally, if urban areas have more homes in substandard condition, fewer homes would be expected to qualify for multi-peril coverage. Still, the extent of coverage in urban areas is a concern, even if it is driven in part or totally by demand conditions or risk factors.

However, in Texas, when the three MSAs are compared with non-metropolitan areas, it is the latter that have the highest percentage of dwelling fire policies. Dwelling fire policies comprised 22.1 percent of the market in the three MSAs compared to 30 percent for non-

⁹ There is no ideal measure of availability. All that can be observed are insurance transactions, which reflect both the supply of and demand for insurance. Some studies have used the proportion of policies written through the residual market (i.e., FAIR plans for home insurance) and the proportion of uninsured homes. The former measure is precluded for Texas as it does not have a residual market mechanism for home insurance; Texas relies on certain insurers that are not subject to price regulation to serve as an alternative for a residual market. It also is difficult to construct meaningful measures of uninsured homes. While it is possible to determine the number of residential structures with homeowners or dwelling fire insurance, obtaining a commensurate measure of the total structures eligible for insurance is problematic. Multi-unit structures can be insured by residential insurance policy or a commercial policy. The Texas data also combine all homeowner's multi-peril insurance policy forms and do not provide a breakdown by policy form.

¹⁰ According to 1990 Census data, 15.4 percent of housing units were in multi-unit structures in the identified metropolitan areas of Texas, compared with only 12.1 percent in other areas of the state. If an owner of a multi-unit structure occupies one of the units, he has the choice of purchasing a dwelling fire policy or a homeowners policy to cover the entire structure. If the owner does not live in one of the units of a multi-unit structure, he must purchase a residential or commercial fire policy to cover the structure.

metropolitan areas. There are two observations that should be considered in reviewing these results, which differ from urban vs. non-urban comparisons of the type of coverage purchased in other states. First, a high percentage of dwelling fire policies in urban core areas could be masked by a low percentage of dwelling fire policies in the suburbs. Second, the purchase of dwelling fire policies can be common in certain rural areas for some of the same reasons that contribute to their high proportion in inner-city neighborhoods.

Differences Within Metropolitan Areas

While the data examined above do not suggest that metropolitan insurance premiums are excessive relative to non-metropolitan premiums or that metropolitan areas have a higher proportion of dwelling fire policies, it is possible that market performance varies across neighborhoods within metropolitan areas. In other words, insurance prices could be high in some inner-city neighborhoods, but not in other urban or suburban neighborhoods because of conditions unique to the inner-city areas. The availability of property insurance also is alleged to be more restricted in the core areas of cities with high concentrations of minorities than in other urban and suburban neighborhoods.

To examine market performance at a more refined geographic level, Table 3 presents cross-tabulations of average premium, loss cost, and loss ratio measures across ZIP codes grouped by the percentage of minority persons.¹¹ This data set encompasses 485 ZIP codes in the three large metropolitan examined above: Dallas-Fort Worth, Houston-Galveston-Brazoria, and San Antonio. We excluded Zip codes with less than 1,000 policies (dwelling fire

¹¹ ZIP codes were divided into the following categories: low-minority (0-10 percent), medium minority (10 percent-50 percent), and high-minority (50 percent+). Minority individuals encompass Blacks and Non-Black Hispanics. These are the minority groups of greatest interest in Texas and the subject of previous Texas studies.

and homeowners combined). This ensures that there are a sufficient number of exposures in the Zip codes analyzed to provide meaningful information.¹² In total, the 485 Zip code level observations we obtained represent 52.1 percent of the Texas population in 1990.

It must be stressed that these simple comparisons cannot be used to determine whether there is evidence of unfair discrimination or a lack of unfair discrimination. At the same time, they are useful in establishing a starting point in assessing the cost of insurance in inner city and minority areas. Interestingly, Table 3 does not indicate that average premiums change significantly with minority concentration. For homeowners insurance, the average premium per home decreases rather than increases with the percentage of minority residents. The same pattern occurs for dwelling fire insurance.

The pattern observed with respect to the average premium per \$1,000 also fails to show a strong positive relationship between price and minority concentration. For homeowners insurance, the average premium increases only slightly from \$9.82 per \$1,000 of insurance in low-minority ZIP codes to \$9.86 per \$1,000 in high-minority ZIP codes. On the other hand, the average premium per \$1,000 for dwelling fire policies decreases from \$6.05 per \$1,000 for low-minority ZIP codes to \$5.87 per \$1,000 for high-minority ZIP codes. Interestingly, for both homeowners and dwelling fire insurance, the average premium per \$1,000 was lower in Zip codes with 10-50 percent minorities than in either low or high-minority Zip codes.

The patterns with respect to loss costs and loss ratios are somewhat ambiguous. Average loss costs per home for homeowners insurance are highest in mid-minority Zips and lowest in high-minority Zips. For dwelling fire insurance, the average loss cost per home

¹² Some Zip codes are simply postal addresses and others encompass areas that are predominantly occupied by commercial structures.

decreases consistently with minority concentration, as does the average loss cost per \$1,000. In contrast, the average loss cost per \$1,000 increases from \$5.41 in low-minority Zips to \$5.68 in high-minority Zips for homeowners insurance.

With one exception, the loss ratios for the different categories of Zips vary little, ranging between 60 and 62 percent for both homeowners and dwelling fire insurance. The one exception is dwelling fire insurance in high-minority Zip codes where the loss ratio was 50.6 percent. It is not clear whether this is a temporary anomaly or reflects systematic pricing flaws. However, on the whole, these simple comparisons do not reveal pervasive pricing inequities between low and high-minority areas.

As in the metropolitan versus non-metropolitan comparisons, the percentage of dwelling fire exposures of all residential property policies in 1997 is used as a crude indicator of availability across Zip codes in Table 4. The use of dwelling fire policies as a relative measure of availability across Zip codes is subject to the same qualifications discussed above for Table 2. Table 4 reveals that the proportion of dwelling fire policies is positively related to minority concentration. For all three MSAs combined, the percentage of dwelling fire policies increases from 20.3 percent in low-minority Zips to 36.1 percent in high-minority Zips. This same pattern occurs in each of the MSAs.

These simple comparisons contrast with some allegations about urban insurance conditions and are consistent with others. We do not find that premiums are generally higher in high-minority areas. Also, for the most part, pricing seems to be commensurate with loss costs. This does not mean that high insurance prices are not a matter of concern in some inner-city neighborhoods in Texas or in areas with high concentrations of minorities. We do find that homeowners in high-minority areas tend to purchase a higher proportion of dwelling fire

insurance policies. At the same time, these simple comparisons do not tell us whether this is a supply or a demand driven phenomenon, nor indicate anything about the factors influencing this pattern.

The ambiguity of these simple cross tabulations and the possible influence of other variables besides race indicate the need for multivariate statistical analysis to properly identify the factors causing these patterns and whether there is substantive evidence of unfair discrimination with respect to the pricing of insurance or the availability of homeowners insurance coverage. The next two sections present the methodology and results of the primary empirical contribution of this paper.

Data and Methodology for Multivariate Analysis

Data

The Zip code data examined in Tables 1-4 are utilized in our multivariate statistical analysis. We merged these data with the Texas State Census file from the U.S. Bureau of the Census. The Census data provide detailed demographic, economic and housing information that is used to construct the variables essential to controlling for the effects of various factors expected to influence insurance transactions. We focused on the three MSAs studied in Section II: Dallas-Ft. Worth, San Antonio, and Houston-Galveston-Brazoria. These MSAs include the following Texas counties: Collin, Denton, Ellis, Johns, Kaufman, Parker, Tarrant, Dallas, Brazoria, Ft. Bend, Galveston, Harris, Montgomery, Liberty, Guadalupe, Waller, Comal, Rockwall, and Bexar.

Zip codes have been developed for the needs of postal distribution and not for defining homogeneous neighborhoods. However, they provide a convenient way for reporting insurance data in smaller geographic units than a city or county and Zip codes provide the

most refined geographic breakdown available for insurance data. Insurers often use clusters of Zip codes to configure their rating territories. The Census Bureau also provides economic, demographic and housing data by Zip code, which facilitates links with the insurance data.

Methodology

One way to assess pricing efficiency in urban areas is to examine the primary causes of or variables associated with claim costs. If claim costs are higher in areas with a higher concentration of minorities, then it is reasonable to expect that these areas will be subject to higher insurance prices. Thus, higher premiums in some or most higher percentage minority areas do not necessarily constitute evidence of unfair discrimination if claim costs are also higher in these areas. The key question is whether the difference in claim costs and other economic/demographic factors account for all of the difference in premiums, or whether the racial composition of an area has a residual effect that suggests the presence of unfair discrimination.

To examine some of the drivers of claims cost at the Zip code level we estimate a claims model of the following form:

$$\text{Log}(AVGCC)_i = \mathbf{a} + \beta_c \% \text{Minority} + \mathbf{g}_c \mathbf{Z}_i + \mathbf{e}_{c,i} \quad (1)$$

where β_c is the sensitivity of claims costs to $\% \text{Minority}$ in the Zip code, \mathbf{Z} is a vector of economic, demographic and housing explanatory variables with a corresponding vector of coefficients \mathbf{g}_c , and $e_{c,i}$ is the error term for the i th observation in the claims cost model.¹³ In this model, $\% \text{Minority}$ is the percentage of Blacks and Non-Black Hispanics in a Zip code. If $\beta_c = 0$, we can infer that the percentage of minorities does not influence average claims costs.

In contrast, if $\beta_c < 0$, it implies that average claim costs are negatively associated with the percentage of minorities in the Zip code. Finally, if $\beta_c > 0$, then it implies that the presence of minorities is positively associated with claims costs.

For example, Klein (1996) found that claims costs are higher in high-minority areas than in low-minority areas for homeowners insurance. Harrington and Neihaus (1998) obtained similar findings for auto insurance. These findings potentially explain why premiums are higher in some high-minority areas.

The relationship of the percentage of minorities in a Zip code to average claims costs may not say anything directly about the presence or absence of unfair discrimination. However, when the observation of this relationship is combined with an analysis of the relationship of minority concentration to the ratio of losses to premiums, we can determine whether there is statistical evidence of unfair discrimination in pricing and risk selection.

To examine the loss ratio, we utilize a model similar to one used by Harrington and Neihaus (1998). Suppose that the average claim cost ($AVGCC_i$) is the average claim cost per exposure (insured home) in a Zip code i . Further, let λ_i be the equal proportionate loading factor reflecting the average non-claim cost for a particular Zip code i . This loading factor reflects various insurer expenses in servicing policies as well as any profit they retain. The average premium per exposure can be written as:

$$AVGPREM_i = \mu_i \lambda_i AVGCC_i \quad (2)$$

where μ_i is the average mark-up factor relative to expected average costs. According to Harrington and Neihaus, racial discrimination in risk selection (or a higher markup in areas with higher minority populations) implies that μ_i will be higher in areas with larger minority

¹³ Following Butler (1994), we log the explanatory variable average claims costs ($AVGCC_i$) to reduce the positive

populations. This would then produce higher premiums for a given value of $AVGCC_i$. We assume that a higher markup factor in minority areas would be due to an irrational bias on the part of insurers, rather than what economists would consider to be “classic” price discrimination intended to inflate total profits. The latter phenomenon requires special conditions that do not appear to be present in urban insurance markets.¹⁴ We note again that, even in the absence of unfair discrimination, average premiums are likely to be higher in areas with higher minority populations if expected claims costs are higher in these areas.

To put our analysis in terms of a loss ratio, we rewrite Equation 2 so that

$$\overline{Lossratio} = \frac{AVGPREM_i}{AVGCC_i} = \frac{1}{\mathbf{m}_i \mathbf{I}_i}. \quad (3)$$

Ideally, we would like to calculate the loss ratio using *expected* losses and *expected* premiums. However, this information is not available and we use actual losses and premiums as proxies for their expected values. Our data set encompasses five years of experience by Zip code. Even with five years of data, there is some “noise” in our statistical analysis because the loss distribution of actual claims departs somewhat from the true loss distribution. This is a greater problem in homeowners insurance because homeowners insurance claims are less frequent than auto insurance claims. Homeowners insurance claims also are more subject to random shocks, such as storms. We employ several devices in the empirical specification of our model to counteract the random volatility in homeowners claims.

By taking the log of Equation 3 we obtain:

$$\text{Log}(\overline{Lossratio}) = -\log(\mathbf{m}_i) - \log(\mathbf{I}_i) \quad (4)$$

skewness in the regression’s error term.

¹⁴ These special conditions are a sustainable monopoly or oligopoly and a lower elasticity of demand for insureds who are subject to a higher markup. Neither of these conditions appear to be the case in minority insurance markets.

Thus, if unfair discrimination in pricing and risk selection is present, we expect Zip

$$\overline{\text{Log}(\text{Lossratio})}_i = \alpha + \beta_{LR} \% \text{Minority} + \mathbf{g}_{LR} \mathbf{X}_i + \varepsilon_{LR,i} \quad (5)$$

code areas with larger percentages of minorities to have a higher μ_i and that realized loss ratios will be lower in those areas than in areas with a lower μ_i .¹⁵

Our data does not provide information on the racial composition of the insured population; it only provides information on the racial composition of the total population in a Zip code. Thus, we cannot estimate a structural model of the loss ratio. This structural model would be able to control for the self-selection bias that might arise if buyers facing the highest priced coverage are less likely to buy insurance. Instead, we follow Harrington and Neihaus and estimate the following reduced form model for the loss ratio:

where $\% \text{Minority}$ is the percentage of blacks and non-black Hispanics in Zip code i , \mathbf{X}_i is a vector of economic, demographic and housing variables with a corresponding vector \mathbf{g}_{LR} of coefficients that could affect μ_i , and $\varepsilon_{LR,i}$ is the error term of observation i in the loss ratio equation. The estimate of β_{LR} represents the sensitivity of $[-\log(\mu_i) - \log(\mu_i)]$ to changes in $\% \text{Minority}$. If \mathbf{X}_i does not omit any variables affecting μ_i that are also correlated with $\% \text{Minority}$, then a non-negative estimate of β_{LR} is inconsistent with racial discrimination in insurance pricing. In contrast, a negative and significant β_{LR} could be consistent with racial discrimination in pricing risk selection.¹⁶

¹⁵ Unfair discrimination in pricing as well as risk selection (i.e., underwriting) would be expected to affect the loss ratio. Risk selection implicitly affects the prices insureds pay. If a homeowner is unable to obtain insurance from a low-price insurer because the homeowner does not meet the insurer's underwriting standards, the homeowner will be forced to buy insurance from a higher-price insurer with less stringent underwriting standards.

¹⁶ The omitted variable problem refers to the problem caused by failing to include a significant explanatory variable in a regression model. The resulting estimates are biased, thus providing misleading information.

Discussion of Explanatory Variables

The explanatory variables used in the empirical specification of our model require some discussion. Below, we present our rationale for including these variables and our expectations with respect to their relationship with the dependent variables in our regression analysis.

Several variables were selected to reflect the risk of loss. Higher risk is expected to have a positive effect on claims costs and a negative effect on the supply of homeowners multi-peril policies relative to dwelling fire policies. Higher risk also may have a positive effect on loss ratios if insurers' pricing systems do not fully reflect certain risk factors. P_ATT1_4 is the percentage of attached residential housing units. Attached units are subject to higher risk from fires and certain other perils striking adjacent structures. MED_YEAR is the median age of homes in a Zip. P_OLDH also reflects the percentage of homes that are more than 50 years old. Older homes are more subject to losses if their electrical wiring and heating systems have not been updated. P_HEAT is equal to the percentage of homes with oil, wood or kerosene heating systems, which are considered to be more risky than gas and electric systems.¹⁷

P_VACANT is the percentage of vacant homes. Vacant structures face higher risk from arson and vandalism, and may experience higher losses from other perils because of lack of maintenance and monitoring by occupants. Correspondingly, insurers tend to limit coverage for structures that are vacant for more than 30 days and also may limit coverage for nearby occupied homes. LCRIM is the log of the frequency of crime claims (theft and vandalism) per

¹⁷ This is a rough proxy for "risky" heating systems, as Census data do not distinguish between the quality and age of these systems.

exposure and measures the effect of crimes on the cost and availability of coverage. POP_DENS is the number of people per square kilometer and serves as a proxy for “urbanness” and a number of risk variables that are not distinguished in the Census data. Industry studies indicate that urban areas tend to suffer from greater fire and crime rates (NAII, 1994; and IRC, 1997).

Another variable is included to control for some of the volatility that occurs in homeowner’s claims. WIND_DUM is a dummy variable equal to one (zero otherwise) for Zip codes in the top 25 percent of all Zips in terms of the number of wind claims. Windstorms are infrequent but when one occurs it can damage a large number of homes and skew losses and loss ratios in a concentrated area. Insurers’ rates are based on the expected frequency of storms averaged over a long period, e.g., 30 years.

Other variables are hypothesized to affect the supply and demand for insurance. LMED_VAL is the log of the median value of homes in a Zip. P_50000 is the percentage of houses under \$50,000 in value. Insurers may limit the supply of insurance and/or charge higher prices for low value homes because of their greater tendency to be in substandard condition. Owners of low-value homes also may be inclined to purchase less coverage because they have less at risk. Similarly, LMED_INC (log of median household income) and LINC2 (log of median income squared) are used to measure the effect of income on the demand for insurance. Lower income is expected to have a negative effect on the demand for coverage and may be associated with a greater tendency to purchase dwelling fire policies rather than multi-peril policies. P_POOR, the percent of households with incomes below 200 percent of the poverty level, serves a similar purpose. P_MORTO is the percentage of owner-occupied homes with a mortgage, which is expected to have a positive effect on the demand

for coverage. Finally, we employ the log of the total value of housing (LTOTVAL) in a Zip to act as a proxy for the wealth of the households in the Zip code.

Two other variables may influence the demand for coverage and/or consumers' ability to shop for insurance. P_HS is the percentage of adults with at least a high-school education and P_ISO is the percentage of households that are "language isolated". "Language isolated" refers to households where, according to the Census, English is not the primary language. Less education and language isolation may lower the demand for insurance and negatively affect a household's ability to shop for insurance.

Additional explanatory variables are incorporated in our empirical models to reflect other factors that may potentially affect market conditions. P_OWNOCC is the percent of owner-occupied homes and P_SAMRES is the percent of residents in the same house in 1985 and 1990. These variables are associated with neighborhood stability and may reduce risk and be perceived positively by insurers which could have a positive effect on the supply of coverage. P_VEHIC1 is the percent of homes with one or more vehicles. Insureds who purchase both home and auto insurance from the same insurer (a common practice) may receive premium discounts that could result in higher loss ratios.

Finally, PERCMIN, the percent of black and non-black Hispanic residents in a Zip code is utilized as a measure of the racial and ethnic composition of neighborhoods. According to the unfair discrimination hypothesis, greater minority concentration should be associated with lower loss ratios and a greater percentage of dwelling fire policies, all other things being equal. Alternatively, if racial and ethnic discrimination against minorities or minority areas is not a significant factor, then the coefficient for PERCMIN should not be statistically significant.

Several other explanatory variables and interaction terms are included in our regression equations to enhance the precision of our regression equations. These variables are described in the next section where we present our empirical results.

Empirical Results

Descriptive Statistics

Table 5 shows the descriptive statistics for a number of important variables in the sample. Our sample has 485 Zip code level observations. The percentage of minorities as measured by the percentage of black and non-black Hispanics has a sample average of 31.8 percent and ranges between just less than one percent to almost ninety-nine percent. The homeowner's loss ratio has a mean of .6627 and ranges between 0.05 and 3.1363.

Table 6 splits Zip codes into two categories: 1) those with less than 20 percent minorities; and 2) those with a percentage of minorities greater than or equal to 20 percent. Table 6 shows the means and standard deviations for variables in the high and low-minority percentage areas and also shows the results of a two-tailed t-test for statistically significant differences in means.¹⁸ The Zip codes with lower percentages (< 20 percent) of minorities (N = 222) account for approximately 38 percent of the population in the MSAs in our sample and 45 percent of the sample Zip codes. Further, the low-minority Zip codes account for just over 60 percent of the homeowner exposures (dollar value) and almost 40 percent of the dwelling fire exposures (dollar value).

¹⁸ This table is comparable to Harrington and Niehaus (1998) Table 3. These t-tests distinguish between differences in means that could be due solely to random variation in the data from differences that reflect a systematic relationship between variables. A 95 percent confidence level is used as a minimum threshold for statistical significance. This implies that there is less than a 5 percent chance that the measured difference between means is due solely to random variation in the data. The choice of this threshold is consistent with standard practice in univariate comparisons of means.

Almost all of the variables in Table 6 have means exhibiting a statistically significant difference between those areas with a high percentage of minorities and those areas with a low percentage of minorities. One striking observation from the table is that many of these statistically significant variables are related to income such as house value, household income, the percent of homes less than \$50,000, and the percent of high school graduates in a Zip code. Interestingly, the homeowner's loss ratio is significantly higher in areas with more than 20 percent minorities. As discussed earlier, the loss ratio is often thought of an index reflecting the amount of claims returned per premium dollar spent on insurance. Again, this suggests that insureds in areas with a significant percentage of minorities are not being overcharged for insurance and, indeed, appear to pay a lower price in relation to the claims payments they receive than insureds in low-minority areas. We test whether this relationship is sustained in our multivariate statistical analysis below.

Analysis of Claim Costs

We estimate three models of claims costs shown in Panel A of Table 7. Model A has dummy variables to measure the effects of the different counties in the sample. The use of such dummy variables is a standard procedure to account for county-specific factors that are not reflected by the Zip code level variables in the model, such as regulatory or market constraints on rate differences between counties or the quality of police and fire services. Model B estimates the claims cost model without the effects due to counties. Model C shows the coefficient for just the percentage of minorities in the Zip code.

Model C in Table 7, Panel A reveals a statistically significant relationship between the percentage of minorities and the log of the average claims costs. This implies that a higher

percentage of minorities is associated with higher loss costs. As this is not a causal model, it should not be inferred that minority concentration directly causes higher claim costs. Indeed, there is no intuitively plausible explanation for such a causal relationship. Rather, as Klein (1996) and Harrington and Niehaus (1998) suggest, this observed relationship is likely due to omitted variables that directly affect or are associated with claim costs and coincidentally are correlated with minority concentration.¹⁹ This indicates the need for using a more complex model that incorporates as many of these omitted variables as possible.

Models A and B contain a more inclusive set of explanatory variables. Model A and B differ in that Model B does not contain the county effects. The coefficients on the percentage of black and non-black Hispanics in the Zip code in Models A and B are not statistically different from zero. It should be noted that these models include interaction terms with the percentage minority variable. In Models A and B, the percentage of minorities enters the regression singly and as an interaction term with median income, crime claims, the percent of houses less than \$50,000 in value, and the percentage of people less than 200 percent of the poverty level. Interaction terms are estimated to assess whether the combination of two variables has an effect in addition to the individual effects of the two variables.

Panel B, which shows the interaction effects between many of the important variables, reveals that there is not a significant relationship between the percent minorities and claims costs. In fact, Model A shows only three significant variables: percent of residents in the same house as in 1985, the percent of owner occupied homes, and the log of the total value of housing in the Zip code. The percentage of residents in the same house during the period 1985-1990 is our measure of neighborhood stability. However, we see that as this percentage

¹⁹ For example, if minorities tend to be concentrated in areas with more substandard housing and higher crime rates, then it these factors that account for higher claim costs, not the presence of minorities per se.

increases, there is an increase in the log of the average claim costs. This is counter intuitive, but when considered in light of the percent of owner occupied homes in the Zip code, it makes more sense. What appears to drive claims costs here is the percent of owner occupied housing. As owner occupancy increases, there is a decrease in claims costs. Further, as the total wealth of the Zip code increases (as measured by the total housing value) we see the average claims costs decrease.²⁰

Other important variables significantly and positively related to claims costs (reflected in Panel A) are whether the Zip code is in the top 25 percent of all Zip codes ranked by frequency of wind claims, the frequency of crime claims, population density, and the percent of homes in the Zip code with one or more vehicles. What is also interesting is that as the median home value increases there is an associated decrease in claims costs.

Analysis of Loss Ratios

Table 8 shows the reduced form regression results based on Equation 5 (where the loss ratio is the dependent variable) in the previous section. Table 8 also shows three regression models. Model A shows the results with the county effects, model B does not account for county effects and model C shows just the relationship between the log of the loss ratio and the percent of minorities in the Zip code. Again, Panel A shows the full regression results and Panel B shows the marginal effects of interacted variables. Focusing first on model C in panel A, we see that the percentage of minorities is not related to the log of the loss ratio. Looking at model A which includes the county effects, we see that while the percent of minorities by itself is positively and significantly related to the log of the loss ratio, the total

effect of the percentage of minorities in a Zip code including the influence of any interaction terms is not statistically related to the log of the loss ratio (see Panel B).

Of those variables without interaction effects, crime claims and wind claims are positively related to the log of the loss ratio, as are the percent of adults with a high school or greater education in a Zip code and the percent of households with one or more vehicles. All of these variables are associated with an increase in the log of the loss ratio, all other things being held constant. This implies that those Zip codes with higher crime rates or a higher incidence of windstorm claims, return more of the average premium in terms of loss payments to insureds. Further, those consumers with a high school or greater education are arguably more likely to shop for their insurance and are likely to obtain a better price which would have a positive effect on the loss ratio. Finally, if homes with one or more vehicles are often given discounts if they purchase their auto and home coverage from the same carrier, this would also result in a higher loss ratio.

Analysis of the Percentage of Dwelling Fire Policies

To examine the question of availability, we estimated a regression model with the percentage of dwelling fire policies as a dependent variable. The Texas data contain information about dwelling fire premiums, exposures, policy counts, and claims costs. We hypothesize that if a dwelling fire policy was a substitute for a homeowner's policy and if homeowner's policies are not available to minorities due to unfair discriminatory risk selection based on race, then there should be a higher percentage of minorities purchasing dwelling fire policies, all other things being equal.

²⁰ Another possible contributor to this result is that newer suburban neighborhoods may have a larger proportion of new residents.

Because the percent of the market represented by dwelling fire policies is bounded by zero and one, we estimated a tobit regression. We further estimate this regression using a weighted approach to account for heteroskedasticity, weighting each Zip code by the number of single and 1-4 unit attached houses (i.e., residential units) in each Zip. Table 9 shows the results of this estimation with Panels A and B showing the full regression results and the marginal effects of interacted variables, respectively. Once again, we estimate three models.

When %Minority is included as an explanatory variable without interaction terms (shown in model C), we found that its coefficient was statistically significant and positive. This could suggest that minorities are more likely to purchase dwelling fire insurance rather than homeowners insurance, either by choice or because that is the only coverage they can obtain. However, when we interact %Minority with the percent poor in the Zip code, we obtained different results. These results can be found in Table 9, Panel B. Including the total effect of variables' interaction terms, we see that the effect of the percentage of minorities on the market share of dwelling fire is negative and small. Hence, this implies that a higher percentage of minorities in a Zip code has a negative effect on the percentage of dwelling fire insurance sold in a Zip code.²¹

Table 9, Panel A suggests that a number of variables influence the market share for dwelling fire policies. The interpretation of the regression results must be made with care. Essentially, this regression result is a condition result. That is, we are examining only those who have purchased insurance and we cannot account for those who did not. This is important because we are not able to control for the decision to purchase insurance. A second issue

²¹ A possible explanation for this result is that insurers have made special efforts to increase the purchase of homeowners insurance in high-minority areas in response to public pressure.

concerns the fact that this is a reduced form equation that essentially combines both variables that influence demand and variables that influence supply.

With these two caveats in mind, we see that the percentage of high school graduates, the log of crime claims, the percent poor, the percent of attached houses, the percent of vacant houses, and the percent of the population in the armed forces in the Zip code are all positively related to the percent of the market covered by dwelling fire policies. The ratio of the average homeowners premium to the average dwelling fire premium is also positively related to the dwelling fire market share. This implies that as the price of homeowners insurance increases relative to dwelling fire insurance, the market share of dwelling fire increases as dwelling fire becomes a better bargain, all other things being equal. Variables negatively related to the dwelling fire market share include the log of the median value of homes in the Zip code, the log of the median income in the Zip code, and the percent of homes with one or more vehicles. All of these variables are related to income or wealth and are consistent with the hypothesis that those with higher incomes (or wealth) are more likely to purchase a homeowners policy than a dwelling fire policy.

Turning to Table 9, Panel B, we can see the net influence of the interacted variables. Examining model A, we see that the percent of minorities in the Zip code is negative and not significantly related to the dwelling fire market share. When the county effects are excluded (Model C), we see that this negative relationship becomes significant, but it is still small. Other variables are important. The age of the housing stock in the Zip, the percentage of houses less than \$50,000, and the percent of poor in the Zip are positively related to dwelling fire market share. Anecdotal evidence suggests that old houses with lower values are less

likely to qualify for homeowners policies due to their condition. This is consistent with the results of the claim cost regressions.

Further, the percentage of poor in the Zip code affects the demand for homeowners insurance. If homeowners insurance is relatively expensive, poor people are more likely to purchase less expensive dwelling fire policies. We see that the log of the median income in the Zip and the log of the total value of the housing stock are both negatively related to the percentage of dwelling fire policies in the Zip code. This is consistent with the expectation that homeowners in wealthier Zip codes are more likely to purchase homeowners insurance than dwelling fire insurance. Beyond the question of affordability, wealthier households would be expected to have a greater demand for the liability coverage included in homeowners' insurance policies because they have greater assets to protect from lawsuits.

Concluding Observations

Summary of Empirical Results

This study examines urban insurance conditions in Texas and the factors influencing these conditions. We found that the average premium for home insurance and the average cost of claims are somewhat higher in major metropolitan areas in Texas compared with non-metropolitan areas, but these differences are not as severe as urban/non-urban differences found in other states. Similarly, we did not find large differences in average premiums or claims costs across Zip codes distinguished only by their concentration of minority residents. We also found that the ratio of claim costs to premiums is roughly equivalent between low and high-minority Zip codes, suggesting that the pricing for these areas is "actuarially fair".

However, high insurance prices may still be a concern in some minority communities and deserve further analysis.

We also looked at the percentage of insured homes with dwelling fire policies as a crude measure of availability or the quality of coverage. Contrary to what we expected, metropolitan areas had a lower percentage of dwelling fire policies than non-metro areas. On the other hand, simple cross tabulations indicate that the percentage of dwelling fire policies within metropolitan areas increases with the degree of concentration of minorities. This is consistent with similar comparisons in other states.

While these simple geographic comparisons of insurance prices and coverages are interesting in terms of providing a general picture of urban insurance markets, they tell us nothing about the factors driving urban insurance conditions and whether unfair discrimination is a significant problem. Hence, these comparisons only provide a starting point for a more rigorous multivariate statistical analysis of urban insurance markets. Although no examination of available data on insurance transactions can prove or disprove the presence of redlining, our multivariate analysis provides some valuable insights on factors influencing urban insurance conditions and tests for statistical evidence of unfair discrimination.

We did not find any evidence that the racial or ethnic composition of neighborhoods plays any measurable role in determining how much homeowners pay for insurance, nor the kind of insurance they purchase. Rather, factors associated with the risk of loss and the demand for insurance appear to primarily drive the terms of insurance transactions. Among these factors are the presence of low-value homes and geographic variables, such as crime-related claims, which have a positive effect on claim costs. These findings tend to support the soundness of industry risk classification practices and are consistent with the argument that

economic considerations, not irrational bias, determine the supply of insurance to urban areas where minorities are concentrated. Thus, we believe that measures directed towards reducing risk and improving economic conditions constitute the best approach to lower prices and expand the scope of coverage.

Policy Implications

Insurers, community organizations, state insurance departments and other entities are involved in a large number of initiatives to improve urban insurance conditions. Texas is one of the states where an array of programs are being implemented to improve access to insurance and lower its cost. These initiatives involve several key strategies: 1) homeowner education on loss prevention and insurance; 2) various risk reduction measures such as the installation of smoke detectors and neighborhood crime watches; 3) financing for upgrading homes and fixing safety hazards; 4) market assistance plans matching consumers and insurers; 5) establishing distribution outlets in inner-city areas; and 6) insurer education programs, among others. These types of programs are a better way to increase the supply of insurance and lower its cost than regulatory measures that attempt to coerce insurers into writing more policies and arbitrarily lowering their rates in high-risk areas. Doherty and Tennyson (1998) offer some interesting ideas on how programs such as these can address some of the information problems and risk factors that afflict urban insurance markets.

A promising set of initiatives involves enhancing insurers' and producers' understanding of urban markets and facilitating consumers' ability to shop for and purchase insurance under the best possible terms. The Illinois Department of Insurance has developed a path-breaking program to educate insurance company underwriters and marketing personnel

on economic opportunities in the inner city. Company educational programs will be bolstered by efforts underway to make pooled industry data on premiums and losses at a ZIP code level available to all insurers. Research on the causes of urban property losses, both those related to geography and those that are not, could further help insurers to improve the efficiency and fairness of their pricing systems and underwriting criteria.

A second program in Illinois counsels homeowners on how to purchase property insurance. A number of other states, including Texas, are beefing up their insurance consumer education and information efforts, which could benefit urban residents. Other states are using the Illinois program as a model and/or expanding access to insurance market information through special publications, consumer counseling programs, the media, and telephone and computer on-line information systems. Various distribution points such as community organizations and public libraries are being utilized to try to maximize the dissemination of information to underserved groups.

Some states are implementing market assistance plans (MAPs), which are more focused voluntary efforts to match consumers seeking coverage with insurers willing to provide it. Indeed, Texas was one of the first states to establish a MAP for homeowners insurance to help homeowners find coverage. Greater and more effective use of this program should be explored. Urban MAPs, typically coordinated by local community organizations operating under national umbrella groups such as Neighborhood Housing Services (NHS), help insurers overcome their lack of familiarity with risk conditions and insurance needs in inner-city neighborhoods. The programs also efficiently counsel and screen consumers, reducing insurers' uncertainty and risk, and enhancing consumers' incentives and ability to improve the insurability of their properties. Public pressure as well growing awareness of

untapped economic opportunities have motivated a number of insurers to actively participate in urban MAPs. If these programs succeed in significantly increasing entry into urban markets, these markets could sustain long-term improvements in lower prices and increased access to insurance.

The success of competition-enhancing efforts will still leave some urban properties that will be uninsurable by the regulated, private market. Texas utilizes an innovative approach to this problem by allowing Lloyds insurers and reciprocal exchanges to provide insurance to high-risk properties with greater pricing freedom than that given to fully regulated insurers. This approach offers a distinct advantage in that it avoids the suppression of residual market rates in other states that has created cross subsidies, distorted insurance markets and caused some residual market plans to mushroom.

The issue of public subsidies may ultimately prove to be unavoidable if inner-city residents are to have the same opportunities to buy insurance as people in other communities. Such subsidies could take the form of monetary payments to low-income homeowners living in high-cost areas or the insurers who insure them. Unfortunately, subsidies of this kind can encourage over-purchase of insurance as well as diminish incentives to prevent losses. The mechanism used to fund the subsidy (e.g., premium surcharges, taxes, etc.) will affect related economic activities. Hence, subsidies, depending on how they are structured, could worsen economic efficiency and/or equity. The political prospects for explicit subsidies to urban insureds are also dim. Subsidies in the form of greater economic aid to urban communities to improve housing conditions and police and fire protection might prove to be more politically feasible and economically efficient in terms of diminishing the root causes of higher property

insurance costs. This is an area where federal expenditures could yield more long-term benefits than in the regulation of insurance practices.

Local, state and federal government efforts to improve urban insurance markets should be properly integrated in a comprehensive strategy to avoid unnecessary conflicts as well as gaps. Further research should help to better delineate the causes of urban insurance problems and their relative contributions to these problems. The measures implemented to address these problems could be evaluated to determine what works and what does not. This research, in turn, should provide further guidance to regulators and policymakers on how to prioritize and coordinate remedial efforts.

References

- Baumol, W., J. Panzar and R. Willing, 1988 *Contestable Markets and the Theory of Industry Structure* (San Diego: Harcourt Brace Jovanovich).
- Butler, Richard, 1994, "Economic Determinants of Worker's Compensation Trends," *Journal of Risk and Insurance* 61: 383-401.
- The Center for Economic Justice, 1997a, untitled March 1997 report on auto insurance redlining (Austin, Texas).
- The Center for Economic Justice, 1997b, *Worst Redliners Identified: Department of Insurance Fails to Act* (Austin, Texas).
- Chan, Thomas S. F., 1998, "Consumer Complaints, Racial Discrimination, and Distribution Channels in Private Passenger Auto Insurance," *Journal of Insurance Regulation* 17: 24-41.
- Crocker, Keith J. and Arthur Snow; 1986, "The Efficiency Effects of Categorical Discrimination in the Insurance Industry," *Journal of Political Economy* 94: 321-344.
- Cummins, J. David and Mary A. Weiss, 1991, "The Structure, Conduct and Regulation of the Property-Liability Insurance Industry," in Richard W. Kopcke and Richard E. Randall, eds., *The Financial Condition and Regulation of Insurance Companies* (Federal Reserve Bank of Boston): 117-154.
- Doherty, Neil A. and Sharon Tennyson, 1998, "Moral Hazard, Adverse Selection and Community Monitored Insurance Programs," in Robert W. Klein, ed., *Alternative Approaches to Insurance Regulation* (Kansas City, Mo.: National Association of Insurance Commissioners): 195-208.
- Duncan, Michael P., 1995, *The Fair Housing Act and Property Insurance: The Call for Congressional Action* (Des Plaines, Ill.: National Association of Independent Insurers).
- Fix, Michael, and R.J. Struyk, eds., 1993, *Clear and Convincing Evidence: Measurement of Discrimination in America* (Washington, D.C.: Urban Institute Press).
- Galster, George C., 1993, "Use of Testers in Investigating Discrimination in Mortgage Lending and Insurance," in Michael Fix and R.J. Struyk, eds., *Clear and Convincing Evidence: Measurement of Discrimination in America* (Washington, D.C.: Urban Institute Press).
- Harrington, Scott E. and Helen I. Doeringhaus, 1993, "The Economics and Politics of Automobile Insurance Rate Classification," *Journal of Risk and Insurance* 60: 59-84.
- Harrington, Scott and Greg Niehaus, 1992, "Dealing with Insurance Availability and Affordability Problems in Inner Cities: An Analysis of the California Proposal," *Journal of Insurance Regulation* 10: 564-584.

- Harrington, Scott E., and Greg Niehaus, 1998 "Race Redlining, and Automobile Insurance Prices," *Journal of Business* 71 (3): 439-469.
- Insurance Research Council, 1997, *Homeowners Loss Patterns in Eight Cities* (Wheaton, Ill.).
- Joskow, Paul L., 1973, "Cartels, Competition, and Regulation in the Property-Liability Insurance Industry," *Bell Journal of Economics* 4: 375-427.
- Klein, Robert W., 1995, "Market Structure and Performance in Personal Auto and Homeowners Insurance," *NAIC Research Quarterly* 1/2 (April 1995).
- Klein, Robert W., 1996, Urban Homeowners Insurance Markets in Missouri unpublished working paper, National Association of Insurance Commissioners, Kansas City, Missouri.
- Klein, Robert W., 1997, Race, Ethnicity and Auto Insurance in Texas: An Evaluation of the CEJ and OPIC Reports, unpublished working paper, Georgia State University.
- Kunreuther, Howard, 1998, "The Role of Insurance in Dealing with Catastrophic Risks," in Robert W. Klein, ed., *Alternative Approaches to Insurance Regulation* (Kansas City, Mo.: National Association of Insurance Commissioners): 195-208.
- National Association of Insurance Commissioners, 1996, *Improving Urban Insurance Markets: A Handbook on Available Options* (Kansas City, Mo.).
- National Association of Insurance Commissioners, 1998, *Report on Profitability By Line and By State 1997* (Kansas City, Mo.).
- Maddala, G. S., 1983, *Limited Dependant and Qualitative Variables in Economics*, Cambridge University Press, New York.
- Mooney, Sean, 1997, "Risk Classification Helps Cut Your Losses," *National Underwriter (Property & Casualty/Risk & Benefits Management)* v101 (n39 Sep 29).
- National Association of Independent Insurers, 1994, *An Analysis of Crime and Fire Statistics, Dwelling Characteristics, and Homeowners Insurance Losses for Selected Urban Areas* (Des Plaines, Ill.).
- Rejda, George E., 1998, *Principles of Risk Management and Insurance* (Reading, Mass.: Addison-Wesley).
- Scherer, F. M. and David Ross, 1990, *Industrial Market Structure and Economic Performance* (Boston: Houghton Mifflin).
- Schlesinger, Harris, 1998, "Uncommon Knowledge: Bilateral Asymmetry of Information in Insurance Markets," *Risk Management and Insurance Review* 1 (2): v-ix.

Schultz, Jay D., 1997, "Homeowners Insurance Availability and Agent Location," in Gregory D. Squires, ed., *Insurance Redlining: Disinvestment, Reinvestment, and the Evolving Role of Financial Institutions* (Washington, D.C.: Urban Institute Press): 83-96.

Squires, Gregory D. and William Velez, 1988, "Insurance Redlining and the Process of Discrimination," *The Review of Black Political Economy* 16: 63-75.

Squires, Gregory D., William Velez, and Karl E. Taeuber, 1991, "Insurance Redlining, Agency Location, and the Process of Urban Disinvestment," *Urban Affairs Quarterly* 26(4): 567-588.

Squires, Gregory D., ed., 1997, *Insurance Redlining: Disinvestment, Reinvestment, and the Evolving Role of Financial Institutions* (Washington, D.C.: Urban Institute Press).

Texas Department of Insurance, 1993, *Analysis of Texas Automobile Insurance Plan (TAIP) and Homeowners Markets* (Austin).

Texas Department of Insurance, 1996, *Texas Insurance Industry Status 1996* (Austin).

Texas Office of Public Insurance Counsel, 1992, *Recent Trends in the Texas Auto Insurance Market* (Austin).

Texas Office of Public Insurance Counsel, 1994, *Insurance Redlining in Texas: A Preliminary Report* (Austin).

Wissoker, Douglas, Wendy Zimmermann, and George Galster, 1998, *Testing for Discrimination in Home Insurance*, (Washington, D.C.: Urban Institute).

Varian, Hal R., 1992, *Microeconomic Analysis* (New York: W.W. Norton).

D:\data\1999 Redline\jri paper\jri v 1.doc, Last saved by Martin F. Grace.

Table 1
Residential Property Insurance Experience
Texas Metropolitan and Non-Metropolitan Areas
1993-1997

Dwelling Fire						
	Dallas-Ft. Worth	Houston	San Antonio	MSAs Total*	Non-Metro	Ratio of MSA Total to Non- metro
Number of Policies	934,553	961,263	343,959	3,743,223	1,114,211	336%
Written Premiums	383,939,141	418,035,662	123,868,506	1,486,062,474	396,785,824	375%
Exposure (\$1,000)	87,302,731	84,143,956	27,034,068	317,119,351	72,292,349	439%
Paid Losses	372,675,118	158,772,422	83,609,255	908,303,708	196,861,405	461%
Number of Claims	151,100	58,779	41,831	386,637	93,647	413%
Average Premium	411	435	360	397	356	111%
AP/\$1,000	4.40	4.97	4.58	4.69	5.49	85%
Average Loss Cost	399	165	243	243	177	137%
ALC/\$1,000	4.27	1.89	3.09	2.86	2.72	105%
Loss Ratio	0.97	0.38	0.67	0.61	0.50	123%
Frequency (per 100)	16.17	6.11	12.16	10.33	8.40	123%
Cost per Claim	2,466	2,701	1,999	2,349	2,102	112%

Homeowners Multi-Peril						
	Dallas-Ft. Worth	Houston	San Antonio	MSAs Total*	Non-Metro	Ratio of MSA Total to Non- metro
Number of Policies	4,320,853	3,542,038	1,143,970	13,182,636	2,604,696	506%
Written Premiums	3,648,218,413	3,338,110,126	760,190,292	10,740,155,812	1,941,204,097	553%
Exposure (\$1,000)	530,254,854	392,249,059	114,649,812	1,439,952,518	219,778,572	655%
Paid Losses	3,141,308,353	1,376,723,707	556,723,986	6,824,750,584	1,075,424,009	635%
Number of Claims	1,088,188	511,367	241,080	2,549,323	439,850	580%
Average Premium	844	942	665	815	745	109%
AP/\$1,000	6.88	8.51	6.63	7.46	8.83	84%
Average Loss Cost	727	389	487	518	413	125%
ALC/\$1,000	5.92	3.51	4.86	4.74	4.89	97%
Loss Ratio	0.86	0.41	0.73	0.64	0.55	115%
Frequency (per 100)	25.18	14.44	21.07	19.34	16.89	115%
Cost per Claim	2,887	2,692	2,309	2,677	2,445	109%

Source: Texas Department of Insurance

*MSA Total Includes all zip codes in Texas classified as being inside an MSA.

Table 2
Homeowners and Dwelling Fire Policies
Texas Metropolitan and Non-Metropolitan Areas
1997

Area	Dwelling Fire Policies	Homeowners Policies	Total Policies	Percent Dwelling Fire
Dallas-Ft.Worth	934,553.00	4,320,853	5,255,406	17.8%
Houston	961,263.00	3,542,038	4,503,301	21.3%
San Antonio	343,959.00	1,143,970	1,487,929	23.1%
MSAs Total	3,743,223.00	13,182,636	16,925,859	22.1%
Non-Metro Areas	1,114,211.00	2,604,696	3,718,907	30.0%

Source: Texas Department of Insurance

Table 3
Residential Property Insurance Experience by Race
Dallas-Ft.Worth, Houston, San Antonio MSAs
1993-1997

Premiums/Costs	Dwelling Fire		
	Minority Concentration		
	0-10%	10-50%	50%+
Average Premium	418.31	407.19	360.15
Average Premium/\$1,000	6.05	5.77	5.87
Average Loss Cost	227.29	220.49	172.24
Average Loss Cost/\$1,000	3.25	3.11	2.75
Loss Ratio	62.1%	60.1%	50.6%

Premiums/Costs	Homeowners		
	Minority Concentration		
	0-10%	10-50%	50%+
Average Premium	831.89	800.67	744.30
Average Premium/\$1,000	9.82	9.31	9.86
Average Loss Cost	466.61	472.06	442.58
Average Loss Cost/\$1,000	5.41	5.47	5.68
Loss Ratio	61.8%	62.8%	61.2%

Note: Minority encompasses Black and Non-Black Hispanic
Source: Texas Department of Insurance

Table 4
Proportion of Dwelling Fire Policies by Ethnicity
Dallas-Ft.Worth, Houston, San Antonio MSAs
1993-1997

Area/ Pct. Minority	Dwelling Fire Policies	Homeowners Policies	Total Policies	Percent Dwelling Fire
Dallas-Ft. Worth MSA				
0-10%	249,837	1,750,107	1,999,944	12.5%
10-50%	516,607	2,289,839	2,806,446	18.4%
50%+	168,109	280,907	449,016	37.4%
Houston MSA				
0-10%	146,862	787,265	934,127	15.7%
10-50%	531,540	2,259,630	2,791,170	19.0%
50%+	282,861	495,143	778,004	36.4%
San Antonio MSA				
0-10%	13,528	78,077	91,605	14.8%
10-50%	159,973	743,800	903,773	17.7%
50%+	170,458	322,093	492,551	34.6%
All MSAs Combined				
0-10%	1,316,076	5,166,321	6,482,397	20.3%
10-50%	2,414,474	8,629,538	11,044,012	21.9%
50%+	1,126,884	1,991,473	3,118,357	36.1%

Note: Minority encompasses Black and Non-Black Hispanic
Source: Texas Department of Insurance

Table 5
Descriptive Statistics of Sample

Description	Mean	Std. Dev.	Min	Max
Percent Black and Non Black Hispanic in Zip	31.7978	26.6808	0.9940	98.9455
Median Value of House in Zip	76,715.7500	48,520.5500	21,200.0000	479,200.0000
Median Year Houses built in zip	1,971.6900	10.3260	1,939.0000	1,988.0000
Median Income in Zip	32,831.5600	12,610.7100	5,812.0000	91,547.0000
Percent Single or Attached Houses (1 - 4)	14.0854	14.9450	0.0000	100.0000
Wind Claims in top 25 percent of zip code	0.4979	0.5005	0.0000	1.0000
Criminal Claims in Zip (Theft+Vandalism)/Exposures	78.2198	73.7615	0.0000	412.2000
Percent of Housing Units Vacant	11.8789	6.7565	0.0000	75.3010
Population per sq. Kilometer	736.8338	752.2526	1.3695	4,571.1400
Unemployment Rate	6.7046	4.1840	0.0000	34.0580
Percent High School (Or Greater) Education	90.4044	5.9182	70.0201	100.0000
Percent of Poor in Zip (up to 200% of Poverty Level)	31.5633	17.6170	0.0000	90.5660
Percent of Houses Older than 50 Years	12.3596	15.7172	0.0000	100.0000
Percent of Houses Under \$50,000	13.6630	12.4735	0.0000	56.1735
Percent of Market in Condos	2.3902	4.3017	0.0000	35.8521
Percent Owner Occupied	55.5416	18.5485	1.1008	90.1108
Percent of Market in Dwelling Fire Policies	0.2279	0.1293	0.0337	0.6595
Percent Employed in Armed Forces	0.6565	3.9868	0.0000	56.8262
Homeowners Exposures (\$000) in Zip	366,827	379,800	492	2,355,094
Dwelling Fire Exposures (\$000) in Zip	71,752	61,102	135	304,382
Number of Homeowners Policies in Zip	3,169.97	2,739.40	6.80	13,309.20
Number of Dwelling Fire Policies in Zip	812.86	757.11	1.75	6,782.60
Dwelling Fire Loss Ratio	0.6532	0.4936	0.0400	4.4233
Homeowners Loss Ratio	0.6627	0.4435	0.0533	3.1367
Percent of Residents in Zip in Same House as in 1985	43.3123	11.9383	4.9575	75.3676
Percent of Owner Occup'd Houses w/Mortgage	66.4932	21.1789	0.0000	100.0000
Total Housing Units in Zip	7,546.44	5,699.08	17.00	30,322.00
Total Population	18,287.35	13,319.45	41.00	58,216.00
Average Home Owners Premium	8.3667	1.8592	4.5360	15.5268
Average Dwelling Fire Premium	4.9657	1.1757	2.5711	10.2703
Percent Language Isolated	2.8479	1.9044	0.0000	13.7615
Percent of Spanish Speakers	14.5308	15.1360	1.1114	79.2019
Percent of Homes with "Risky" Heating	0.8816	1.8309	0.0000	17.5824
Percent of Homes with One or More Vehicles	53.7421	18.6348	1.1008	90.1108

Sample total observations = 485

Table 6
Separation of Sample into Two Subsamples based on % Minority

Description	% Minorities Lt 20%		% Minorities GE 20%		T-Stat	p-value
	Mean	Std. Dev	Mean	Std. Dev		
Percent Black and Non Black Hispanic in Zip	10.414	4.871	49.767	24.136	-23.830	0.0000
Median Value of House in Zip	92,611	48,693	63,359	44,237	6.920	0.0000
Median Year Houses built in zip	1,977	6.758	1,967.440	10.887	11.037	0.0000
Median Income in Zip	40,600	12,696	26,304	8,009	15.045	0.0000
Percent Single or Attached Houses (1 - 4)	12.755	15.587	15.203	14.318	-1.799	0.0726
Wind Claims in top 25 percent of zip code	0.516	0.501	0.483	0.501	0.721	0.4713
Criminal Claims in Zip (Theft+Vandalism)/Exposures	79.167	75.408	77.424	72.484	0.259	0.7959
Percent of Housing Units Vacant	10.316	7.777	13.192	5.438	-4.769	0.0000
Population per sq. Kilometer	464.519	539.872	965.661	826.657	-7.732	0.0000
Unemployment Rate	4.405	1.691	8.637	4.654	-12.822	0.0000
Percent High School (Or Greater) Education	90.835	6.075	90.043	5.770	1.468	0.1428
Percent of Poor in Zip (up to 200% of Poverty Level)	20.566	11.034	40.804	16.799	-15.342	0.0000
Percent of Houses Older than 50 Years	6.795	9.002	17.036	18.419	-7.542	0.0000
Percent of Houses Under \$50,000	8.168	7.751	18.280	13.766	-9.703	0.0000
Percent of Market in Condos	1.919	3.692	2.786	4.725	-2.219	0.0269
Percent Owner Occupied	64.614	14.613	47.918	18.088	11.026	0.0000
Percent of Market in Dwelling Fire Policies	0.153	0.084	0.291	0.127	-13.791	0.0000
Percent Employed in Armed Forces	0.221	0.447	1.023	5.370	-2.214	0.0273
Homeowners Exposures (\$000) in Zip	483,511	462,944	268,777	254,612	6.451	0.0000
Dwelling Fire Exposures (\$000) in Zip	62,486	59,446	79,538	61,499	-3.085	0.0022
Number of Homeowners Policies in Zip	3,664.840	3,120.790	2,754.130	2,296.960	3.690	0.0002
Number of Dwelling Fire Policies in Zip	585.511	564.853	1,003.910	841.765	-6.293	0.0000
Dwelling Fire Loss Ratio	0.677	0.510	0.633	0.480	0.970	0.3326
Homeowners Loss Ratio	0.609	0.371	0.708	0.492	-2.455	0.0144
Percent of Residents in Zip in Same House as in 1985	42.979	11.504	43.592	12.306	-0.562	0.5742
Percent of Owner Occup'd Houses w/Mortgage	73.030	17.852	61.000	22.203	6.484	0.0000
Total Housing Units in Zip	6,175.97	5,107.980	8,698.060	5,920.470	-4.967	0.0000
Total Population	15,114.10	12,385.930	20,953.840	13,513.080	-4.919	0.0000
Average Home Owners Premium	7.856	1.844	8.796	1.764	-5.718	0.0000
Average Dwelling Fire Premium	4.758	1.261	5.140	1.070	-3.598	0.0004
Percent Language Isolated	2.033	1.307	3.532	2.055	-9.371	0.0000
Percent of Spanish Speakers	5.573	2.868	22.058	17.055	-14.200	0.0000
Percent of Homes with "Risky" Heating	1.208	2.120	0.608	1.497	3.637	0.0003
Percent of Homes with One or More Vehicles	63.531	14.525	45.517	17.728	12.079	0.0000
<hr/>						
Subsample Size	222		263			
Percent of Population in Study in Subsample	37.84		62.16			
Percent of HO Exposures in Subsample	60.29		39.71			
Percent of Dwelling Fire Exposures in Subsample	39.87		60.13			

Table7: Panel A
Weighted Least Squares Estimates: Dependent Variable is Log(AVG Claim Costs)

Label	Model		
	A	B	C
	County Effects	No County Effects	% Minority only
Intercept	4.4352 (20.3090)	4.2879 (22.9161)	1.4524 *** (0.0396)
Percent Black and Non Black Hispanic in Zip	0.0054 (0.0035)	0.0010 (0.0035)	0.0038 *** (0.0038)
Log of Median Value of House in Zip	-0.2882 *** (0.1030)	-0.2067 * (0.1118)	
Percent Single or Attached Houses (1 - 4)	0.0039 (0.0102)	0.0116 (0.0113)	
Median Year Houses built in zip	0.0060 (0.0067)	-0.0070 (0.0066)	
Wind Claims in top 25 percent of zip code	0.2935 *** (0.0536)	0.6054 *** (0.0483)	
Log of Crim. Claims in Zip (Theft+Vandalism)/Exposures	0.1599 *** (0.0594)	0.0724 (0.0625)	
Percent of Housing Units Vacant	0.0006 (0.0041)	-0.0012 (0.0048)	
Population per sq. Kilometer	0.0001 ** (0.0000)	0.0002 *** (0.0000)	
Log of Median Income in Zip	-2.1450 (3.2319)	3.3479 (3.6495)	
Log of Median Income Squared	0.0875 (0.1609)	-0.1864 (0.1789)	
Percent of Residents in Zip in Same House as in 1985	0.0000 (0.0072)	-0.0166 (0.0077)	
Percent of Owner Occup'd Houses w/Mortgage	-0.0044 (0.0042)	-0.0021 (0.0042)	
Percent of Houses Under \$50,000	0.0019 (0.0037)	-0.0086 ** (0.0038)	
Percent of Houses Older than 50 Years	0.0016 (0.0033)	-0.0044 (0.0034)	
Percent of Homes with One or More Vehicles	0.0739 *** (0.0255)	0.0705 ** (0.0280)	
Percent of Homes with "Risky" Heating	0.0532 (0.0512)	0.0188 (0.0356)	
Percent Owner Occupied	-0.0879 *** (0.0255)	-0.0841 *** (0.0280)	
Percent of Poor in Zip (up to 200% of Poverty Level)	0.0077 (0.0067)	0.0066 (0.0080)	
Percent of Old Houses * Percent of Houses lt \$50K	0.0002 * (0.0001)	0.0003 ** (0.0001)	
Percent High School (Or Greater) Education	0.0147 * (0.0076)	0.0001 (0.0086)	
Percent Language Isolated	-0.0196 (0.0193)	-0.1109 *** (0.0172)	
Percentage of Home Owners * Percentage of Same Res	0.0003 ** (0.0001)	0.0004 (0.0001)	
Log of (Total Housing Value in Zip)	0.0053 ** (0.0021)	0.0052 (0.0023)	
Log of (Total Housing Value in Zip) Squared	-0.0043 ** (0.0017)	-0.0042 ** (0.0019)	
Percent Minority * Percent Poor	-0.0002 ** (0.0001)	0.0000 ** (0.0001)	
COLLIN COUNTY	0.8551 *** (0.1342)		

Table7: Panel A
Weighted Least Squares Estimates: Dependent Variable is Log(AVG Claim Costs)

Label	Model		
	A	B	C
	County Effects	No County Effects	% Minority only
DENTON COUNTY	0.2958 ** (0.1252)		
ELLIS COUNTY	0.9199 *** (0.2008)		
JOHNSON COUNTY	0.3777 * (0.2041)		
KAUFMAN COUNTY	0.5951 *** (0.1796)		
PARKER COUNTY	0.8823 *** (0.3047)		
TARRANT COUNTY	1.0647 *** (0.1101)		
BRAZORIA COUNTY	0.3132 ** (0.1315)		
FT BEND COUNTY	0.2593 * (0.1448)		
HARRIS COUNTY	0.3925 *** (0.0929)		
MONTGOMERY COUNTY	0.3155 ** (0.1355)		
BEXAR COUNTY	0.4458 *** (0.1061)		
LIBERTY COUNTY	0.2303 (0.2080)		
GUADALUPE COUNTY	0.4464 ** (0.2060)		
WALLER COUNTY	0.2859 (0.1850)		
COMAL COUNTY	0.1203 (0.2913)		
ROCKWALL COUNTY	1.0520 *** (0.1711)		
DALLAS COUNTY	0.8261 *** (0.1066)		
R Squared	0.6202	0.4673	0.0354
Adjusted R Squared	0.5821	0.4367	

Note: Weight employed is total number of housing unites in zip code. Standard Errors in parenthesis.

*** significant at 0.01 level

** significant at 0.05 level

* significant at 0.10 level

Table 7: Panel B
Estimated Marginal Effects Controlling for Interaction Terms
Dependent Variable is the Log of the Avg Claim Costs

Marginal Effects with respect to	Model	
	A	B
	County Effects	No County Effects
Percent Black and Non Black Hispanic in Zip	0.0005 (0.0024)	0.0003 (0.0024)
Percent of Houses Older than 50 Years	0.0038 (0.0031)	-0.0008 (0.0032)
Log of Median Income in Zip	-1.2421 (1.5821)	1.4253 (1.8139)
Percent of Houses Under \$50,000	0.0039 (0.0037)	-0.0053 (0.0038)
Percent of Poor in Zip (up to 200% of Poverty Level)	0.0023 (0.0055)	0.0059 (0.0066)
Percent of Residents in Zip in Same House as in 1985	0.0156 *** (0.0038)	0.0056 (0.0044)
Percent Owner Occupied	-0.0758 *** (0.0251)	-0.0667 ** (0.0277)
Log of (Total Housing Value in Zip)	-0.0721 ** (0.0289)	-0.0691 ** (0.0313)

*** significant at 0.01 level
** significant at 0.05 level
* significant at 0.10 level

Table 8: Panel A
Weighted Least Squares Estimates: Dependant Variable is Log(Lossratio)

Label	Model	
	A	B
	County Effects	No County Effects
Intercept	3.0418 (19.1974)	-9.3998 (24.8101)
Percent Black and Non Black Hispanic in Zip	0.0069 ** (0.0033)	0.0009 (0.0035)
Log of Median Value of House in Zip	-0.0598 (0.0999)	0.1886 * (0.1113)
Percent Single or Attached Houses (1 - 4)	0.0012 (0.0099)	0.0080 (0.0119)
Median Year Houses built in zip	0.0077 (0.0066)	-0.0039 (0.0069)
Log of Crim. Claims in Zip (Theft+Vandalism)/Exposures	0.1561 ** (0.0604)	0.0786 (0.0618)
Wind Claims in top 25 percent of zip code	0.2990 *** (0.0526)	0.7118 *** (0.0498)
Percent of Housing Units Vacant	-0.0001 (0.0042)	-0.0051 (0.0054)
Log of Median Income in Zip	-3.5838 (3.0425)	3.9419 (3.9579)
Log of Median Income Squared	0.1588 (0.1519)	-0.2323 (0.1937)
Population per sq. Kilometer	0.0000 (0.0000)	0.0001 *** (0.0000)
Percent of Residents in Zip in Same House as in 1985	-0.0028 (0.0071)	-0.0189 ** (0.0078)
Percent of Owner Occup'd Houses w/Mortgage	-0.0042 (0.0040)	-0.0013 (0.0044)
Percent of Houses Under \$50,000	0.0019 (0.0037)	-0.0129 *** (0.0039)
Percent Employed in Armed Forces	0.0129 (0.0140)	0.0155 (0.0165)
Percent High School (Or Greater) Education	0.0189 ** (0.0077)	-0.0033 (0.0090)
Percent of Homes with One or More Vehicles	0.0634 ** (0.0253)	0.0626 ** (0.0294)
Percent of Homes with "Risky" Heating	0.0309 (0.0478)	0.0114 (0.0344)
Percent of Poor in Zip (up to 200% of Poverty Level)	0.0085 (0.0064)	0.0042 (0.0080)
Percent of Old Houses * Percent of Houses It \$50K	0.0001 (0.0001)	0.0003 *** (0.0001)
Percent Language Isolated	-0.0028 (0.0189)	-0.1054 *** (0.0179)
Percentage of Home Owners * Percentage of Same Residence	0.0003 *** (0.0001)	0.0004 *** (0.0001)
Log of (Total Housing Value in Zip)	0.0044 ** (0.0020)	0.0047 ** (0.0023)
Log of (Total Housing Value in Zip) Squared	-0.0038 ** (0.0017)	-0.0040 ** (0.0019)

Table 8: Panel A
Weighted Least Squares Estimates: Dependant Variable is Log(Lossratio)

Label	Model	
	A	B
	County Effects	No County Effects
COLLIN COUNTY	1.2515 *** (0.1336)	
DENTON COUNTY	0.6967 *** (0.1243)	
ELLIS COUNTY	1.2412 *** (0.1982)	
JOHNSON COUNTY	0.6667 *** (0.1801)	
KAUFMAN COUNTY	0.8566 *** (0.1784)	
PARKER COUNTY	1.0966 *** (0.2743)	
TARRANT COUNTY	1.3753 *** (0.1131)	
BRAZORIA COUNTY	0.4066 *** (0.1220)	
FT BEND COUNTY	0.4756 *** (0.1522)	
HARRIS COUNTY	0.4972 *** (0.0943)	
MONTGOMERY COUNTY	0.7015 *** (0.1409)	
BEXAR COUNTY	0.8690 *** (0.1060)	
LIBERTY COUNTY	0.3784 * (0.2132)	
GUADALUPE COUNTY	1.0007 *** (0.1902)	
WALLER COUNTY	0.5978 *** (0.1559)	
COMAL COUNTY	0.5395 * (0.2907)	
ROCKWALL COUNTY	1.3630 *** (0.1752)	
DALLAS COUNTY	1.0971 *** (0.1090)	
R Squared	0.6707	0.4804
Adjusted R Squared	0.6377	0.4509

Note: Weight employed is total number of housing unites in zip code. Standard Errors in parenthesis.

Table 8: Panel B
Estimated Marginal Effects Controlling for Interaction Terms
Dependent Variable is the Log of the Loss Ratio

Marginal Effects with respect to	Model	
	A	B
	County Effects	No County Effects
Percent Black and Non Black Hispanic in Zip	0.0008 (0.0022)	0.0010 (0.0023)
Percent of Houses Older than 50 Years	0.0049 (0.0030)	0.0002 (0.0033)
Log of Median Income in Zip	-1.9455 (1.4853)	1.5451 (1.9697)
Percent of Houses Under \$50,000	0.0036 (0.0036)	-0.0090 ** (0.0040)
Percent of Poor in Zip (up to 200% of Poverty Level)	0.0018 (0.0053)	0.0044 (0.0067)
Percent of Residents in Zip in Same House as in 1985	0.0135 *** (0.0037)	0.0028 (0.0046)
Percent Owner Occupied	-0.0652 *** (0.0248)	-0.0555 * (0.0290)
Log of (Total Housing Value in Zip)	-0.0636 ** (0.0281)	-0.0670 ** (0.0314)

Note: Weight employed is total number of housing unites in zip code;Standard Errors in parenthesis.

*** significant at 0.01 level

** significant at 0.05 level

* significant at 0.10 level

Table 9: Panel A
Tobit Results: Dependant Variable is Market Share of Dwelling Fire Policies in Zip
Weighted by Number of Housing Units in Zip Code

Label	Model			
	A	B	C	D
	County Effects & No Interactions	County Effects & Interactions	No County Effects & Interactions	No County Effects & No Interactions
Intercept	0.5522 ** (0.2808)	12.7766 *** (3.4502)	13.5859 *** (3.5498)	0.5581 ** (0.2599)
Percent Black and Non Black Hispanic in Zip	-0.0005 * (0.0002)	-0.0233 ** (0.0116)	-0.0373 *** (0.0117)	-0.0005 ** (0.0002)
Percent High School (Or Greater) Education	0.0038 *** (0.0008)	0.0019 ** (0.0008)	0.0015 * (0.0008)	0.0029 *** (0.0008)
Wind Claims in top 25 percent of zip code	0.0008 (0.0068)	0.0004 (0.0064)	0.0153 *** (0.0057)	0.0161 *** (0.0060)
Log of Crim. Claims in Zip (Theft+Vandalism)/Exposures	-0.0061 * (0.0034)	0.0139 ** (0.0064)	0.0077 (0.0065)	-0.0103 *** (0.0033)
Percent of Poor in Zip (up to 200% of Poverty Level)	0.0029 *** (0.0006)	0.0025 * (0.0014)	0.0018 (0.0015)	0.0034 *** (0.0006)
Log of Median Value of House in Zip	-0.1212 *** (0.0102)	-0.1049 *** (0.0111)	-0.0981 *** (0.0107)	-0.1116 *** (0.0099)
Log of Median Income in Zip	0.0550 * (0.0293)	-2.2250 *** (0.6320)	-2.3234 *** (0.6504)	0.0522 * (0.0275)
Log of Median Income Squared		0.1069 *** (0.0292)	0.1087 *** (0.0300)	
Percent of Houses Older than 50 Years	0.0021 *** (0.0002)	0.0027 *** (0.0002)	0.0027 *** (0.0002)	0.0022 *** (0.0002)
Percent Single or Attached Houses (1 - 4)	0.0095 *** (0.0014)	0.0106 *** (0.0013)	0.0107 *** (0.0014)	0.0095 *** (0.0015)
Percent of Housing Units Vacant	0.0022 *** (0.0005)	0.0018 *** (0.0005)	0.0019 *** (0.0005)	0.0022 *** (0.0005)
Ratio of AVG HO Prems to AVG DW Prems	0.0122 (0.0103)	0.0161 * (0.0094)	0.0119 (0.0086)	0.0125 (0.0091)
Percent of Houses Under \$50,000	0.0018 *** (0.0004)	0.0028 *** (0.0004)	0.0020 *** (0.0004)	0.0013 *** (0.0004)
Unemployment Rate	0.0021 (0.0017)	-0.0020 (0.0018)	-0.0016 (0.0019)	0.0015 (0.0018)
Percent of Homes with "Risky" Heating	-0.0064 * (0.0034)	-0.0046 (0.0033)	-0.0077 ** (0.0031)	-0.0089 *** (0.0031)
Percent Owner Occupied	0.0028 (0.0026)	0.0068 ** (0.0027)	0.0069 ** (0.0027)	0.0040 (0.0027)
Percent of Homes with One or More Vehicles	-0.0034 (0.0027)	-0.0081 *** (0.0028)	-0.0081 *** (0.0028)	-0.0047 * (0.0027)
Percent Employed in Armed Forces	0.0025 * (0.0015)	0.0026 * (0.0014)	0.0008 (0.0013)	0.0010 (0.0014)
Percent of Old Houses * Percent of Houses lt \$50K		-0.0001 *** (0.0000)	0.0000 *** (0.0000)	
Percent Language Isolated	0.0043 ** (0.0020)	0.0019 (0.0020)	-0.0037 ** (0.0018)	-0.0013 (0.0017)
Percent Minority *Log of Median Income		0.0021 ** (0.0011)	0.0034 *** (0.0011)	
Percent Minority * Percent Poor		0.0000 * (0.0000)	0.0001 *** (0.0000)	
Percent Poor * Log of Criminal Claims		-0.0001 (0.0002)	-0.0001 (0.0002)	
Percent Minority* Log of Crim Claims		-0.0001 (0.0002)	-0.0001 (0.0002)	
Log of (Total Housing Value in Zip)	-0.0002 (0.0001)	0.0003 * (0.0002)	0.0003 * (0.0002)	-0.0002 (0.0001)
Log of (Total Housing Value in Zip) Squared		-0.0004 *** (0.0001)	-0.0004 *** (0.0001)	
COLLIN COUNTY	-0.0192	-0.0371 **		

Table 9: Panel A
Tobit Results: Dependant Variable is Market Share of Dwelling Fire Policies in Zip
Weighted by Number of Housing Units in Zip Code

Label	Model			
	A	B	C	D
	County Effects & No Interactions	County Effects & Interactions	No County Effects & Interactions	No County Effects & No Interactions
DENTON COUNTY	(0.0188) -0.0110	(0.0175) -0.0181		
ELLIS COUNTY	(0.0171) -0.0126	(0.0159) -0.0120		
JOHNSON COUNTY	(0.0245) 0.0087	(0.0227) 0.0170		
KAUFMAN COUNTY	(0.0263) -0.0005	(0.0244) -0.0112		
PARKER COUNTY	(0.0264) 0.0234	(0.0245) 0.0267		
TARRANT COUNTY	(0.0255) -0.0156	(0.0237) -0.0162		
BRAZORIA COUNTY	(0.0140) -0.0262	(0.0130) -0.0197		
FT BEND COUNTY	(0.0211) -0.0343 *	(0.0197) -0.0434 **		
HARRIS COUNTY	(0.0200) -0.0434 ***	(0.0186) -0.0524 ***		
MONTGOMERY COUNTY	(0.0134) -0.0420 **	(0.0124) -0.0523 ***		
BEXAR COUNTY	(0.0186) -0.0411 ***	(0.0172) -0.0507 ***		
LIBERTY COUNTY	(0.0150) -0.0490	(0.0143) -0.0530		
GUADALUPE COUNTY	(0.0348) -0.0371	(0.0323) -0.0400 *		
WALLER COUNTY	(0.0246) -0.0488	(0.0228) -0.0475		
COMAL COUNTY	(0.0313) -0.0722 *	(0.0290) -0.0496		
ROCKWALL COUNTY	(0.0408) -0.0314	(0.0379) -0.0312		
DALLAS COUNTY	(0.0280) -0.0082	(0.0258) -0.0170		
	(0.0141)	(0.0132)		
log l	851.1720	889.6400	861.5200	830.5855
Pseudo R2 llr restricted = 32.7299	0.6147	0.6313	0.6193	0.6051

Table 9: Panel B
Estimated Marginal Effects Controlling for Interaction Terms
Dependant Variable is the Market Share for Dwelling Fire Policies

	Model			
	A	B	C	D
	County Effects & No Interactions	County Effects & Interactions	No County Effects & Interactions	No County Effects & No Interactions
<i>Marginal Effects with respect to:</i>				
Percent Black and Non Black Hispanic in Zip	-0.0004 (0.0002)	-0.0003 (0.0002)	-0.0005 ** (0.0002)	-0.0006 ** (0.0002)
Percent of Houses Older than 50 Years	0.0021 *** (0.0002)	0.0021 *** (0.0002)	0.0022 *** (0.0002)	0.0022 *** (0.0002)
Log of Median Income in Zip	-0.7171 *** (0.1403)	-1.0479 *** (0.3001)	-1.0830 *** (0.3094)	-0.5071 *** (0.1452)
Percent of Houses Under \$50,000	0.0023 *** (0.0004)	0.0022 *** (0.0004)	0.0015 *** (0.0004)	0.0016 *** (0.0004)
Percent of Poor in Zip (up to 200% of Poverty Level)	0.0033 *** (0.0006)	0.0031 *** (0.0006)	0.0033 *** (0.0006)	0.0038 *** (0.0006)
Log of (Total Housing Value in Zip)	-0.0072 *** (0.0016)	-0.0067 *** (0.0016)	-0.0065 *** (0.0016)	-0.0074 *** (0.0016)

Note: Weight employed is total number of housing unites in zip code. Standard Errors in parenthesis.

*** significant at 0.01 level

** significant at 0.05 level

* significant at 0.10 level