The Demand for Automobile Insurance: Evidence from Underserved Areas in California

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Abstract

Automobile insurance availability is a serious issue for motorists, regulators and the insurance industry. The costs imposed on the system by uninsured motorists are not trivial. In order to minimize these costs it is necessary to understand the factors that lead motorists to drive without insurance. This paper uses data reported to the California Department of Insurance, as well as demographic data collected at the ZIP code level, to analyze the demand for auto insurance in areas that the California Department of Insurance has designated as underserved. The results show that areas – as measured by ZIP codes – that are saddled with high poverty and areas that are predominately urban are more likely to have lower demand for automobile insurance. However, the fact that a certain area is predominately minority does not alone make it more likely to exhibit lower demand for automobile insurance.

Introduction

It has long been recognized that having access to affordable insurance is critical to everyday life in American society. Insurance is even more important in the automobile context because many states have mandated that motorists purchase insurance. As important as insurance is to the average American citizen, it is even more essential for urban communities and has been for some time. In 1968, a federal advisory committee observed:

> Insurance is essential to revitalize our cities. It is a cornerstone of credit. Without insurance, banks and other financial institutions will not – and cannot make loans. New housing cannot be constructed, and existing housing cannot be repaired. New businesses cannot expand, or even survive.
>
> Without insurance, buildings are left to deteriorate; services, goods and jobs diminish. Efforts to rebuild our nation's inner cities cannot move forward. Communities without insurance are communities without hope. (President's National Advisory Panel, 1968).

As the preceding paragraphs illustrate, a better understanding of both the demand and availability of insurance could have profound public policy implications; particularly if it led to a better understanding of the availability – or lack thereof – of insurance in urban areas where it is so badly needed.

The need to understand the availability of insurance is especially urgent in the context of automobile insurance. Because state law mandates automobile insurance in most states as a necessary prerequisite to driving, not being able to secure insurance means that many otherwise qualified people do not have access to an

automobile. This reality can have severe implications for many minorities living in urban areas because they are often denied opportunities for employment in suburban areas simply because they lack the transportation to get to the job site (Raphael and Stoll, 2001). However, because car ownership rates for low skilled workers are sensitive to small changes in operating costs, even a small change in cost or availability of auto insurance can have a significant impact in opening opportunities for minorities everywhere, but especially in urban areas (Raphael and Rice, 2000).

Statistics show that this access problem is particularly acute in California because so many people rely on automobiles to get to work. According to the Census 2000 conducted by the U.S. Census Bureau, 10,432,462 workers over 16 years of age, which is 71.8% of all workers over 16, drive to work alone in a car, truck or van. According to the 2000 census another 2,113,313 workers over 16, or 14.5% of all workers over 16, carpool to work in a car, truck or van. That means 12,545,775 workers over 16 years of age or 86.3% of all workers over 16 rely on a car, truck or van to get to work. Only 1,979,547 workers over 16 or 13.7% of all workers over 16 walk to work, use public transportation or work at home. These statistics illustrate how important it is for people to have access to automobile insurance to allow them to get to work.

This problem of securing access to automobile insurance for those who perhaps need it the most was one of the major reasons that led California to enact the provisions creating the ‘underserved’ designation. As the California Department of Insurance (CDI) says on its website, “The purpose of the regulations is to address the issue of availability and affordability of insurance in "underserved" communities and to promote anti-discrimination so that all have equal access to insurance coverage in California.” California has placed significant focus on addressing this problem of inadequate access to automobile insurance. It is doing this not only through its creation of the underserved designation, but also through increasing the level of transparency in the insurance industry by requiring insurers to publicly disclose data from home, personal auto, commercial multiple peril and commercial fire policies in California, in all ZIP codes identified as "underserved". The California Commissioner of Insurance collects and reports earned exposures for the affected lines, as well as the number of agents and service offices in the underserved areas as a percentage of statewide totals for each insurance company.

California is an ideal state in which to conduct this study for several reasons. Not only does it provide a workable framework for studying these access issues through its creation of the underserved designation, it also provides an unprecedented level of transparency discussed above that allows us to study the impact of demographics on access to automobile insurance. Demographically, California also provides an excellent laboratory in which to study why certain areas have issues with automobile insurance access. Besides being the most heavily populated state in the United States with nearly 34 million residents, California provides a great deal of diversity because it contains large numbers of different ethnic groups and it has many different levels of income and education stratification. According to the most recent census taken in 2000, 26.2% of California residents were born in foreign countries and 39.5% of California residents belong to families that speak a language other than English in the home. For comparison purposes, 11.1% of United States residents were born in foreign countries and 17.9% of all Americans belong to families that speak a language other than English in the home. With respect to social diversity, 63.4% of California are white, 7.4% Black or African American, 12.3% Asian. Additionally, 32.4% identify themselves as Hispanic or Latino.

This study will present and then estimate a model of the demand for insurance in areas deemed underserved by the California Department of Insurance, areas that are almost underserved and finally the state of California as a whole. These three areas are used to determine whether there are factors that are affecting demand differently in these three areas. Demographic data obtained from the 2000 United States Census is then used to regress the insurance demand variable on various factors such as poverty, income, minority status and whether the area is urban or rural.

The goal of this study is to attempt to pinpoint factors that exist in these almost underserved areas that may be used to help lower the uninsured motorist rate in those areas that meet the full definition of underserved as defined by the California Department of Insurance. These factors will help us to better explain why people exhibit a demand for auto insurance. We will investigate potential barriers that need to be overcome so that access to insurance is improved for all potential motorists whether or not they happen to live in underserved or almost underserved areas.

Previous literature has focused on discrimination in insurance in the form of “redlining” that raises prices and restricts the availability of coverage (Squires, DeWolfe, and DeWolfe, 1979; Squires, Velez, and

Taeuber, 1991). Harrington and Niehaus investigated whether racial discrimination affects market prices of auto insurance in Missouri (Harrington and Niehaus, 1998). This paper employs a framework established by a state government to examine factors that influence automobile insurance demand. This analysis will allow us to provide direct advice to the state in order to improve the underserved framework so that California can better effectuate its goal of increased access to automobile insurance for all Californians. Because of the degree of specificity of the data that insurers are required to report in California, we are able to directly observe the uninsured motorist rate in underserved communities and compare it to the uninsured motorist rate in California as a whole. Because automobile insurance is mandatory under California law in order to drive, employing the uninsured motorist rate allows us to use a very direct measure of auto insurance demand in order to investigate insurance access rather than concentrating on insurance pricing or firm profits. This study will analyze those factors that influence auto insurance demand at the ZIP code level while controlling for other factors that might influence the results.

California Underserved Areas

California has promulgated regulations to "address the issue of availability and affordability of insurance in 'underserved' communities and to promote anti-discrimination so that all have equal access to insurance coverage in California." These regulations require the California Department of Insurance to collect and analyze data from home, personal auto, commercial multiple peril and commercial fire insurers in California, in all ZIP codes identified as "underserved". It is unclear whether California policy makers have taken action based on this information. The results reported in this paper could assist them in deciding what action to take to increase access to insurance in the state. Underserved ZIP codes, as defined by the California regulations, are those in which:

1. The proportion of uninsured motorists is ten percentage points above the statewide average;
2. The per capita income of the community (as measured in the most recent U.S. Census), is below the fiftieth (50th) percentile for California; and
3. The community (as measured in the most recent U.S. Census), is predominantly (2/3) minority (2004 Commissioner's Report on Underserved Communities).

The California Code of Regulations - §2646.6 provides that a predominately minority community can be quantified as any community that is composed of two-thirds or more minorities. Minorities are those people that fall into one or more of the following groups: American Indian or Alaskan Native, Asian or Pacific Islander, African-American, or Latino.

The uninsured motorist rate is calculated by subtracting the number of insured vehicles in the ZIP code from the number of registered vehicles in the ZIP code and dividing that difference by the number of registered vehicles in the ZIP code. The estimated rate of uninsured motorists is based upon vehicle registration data maintained by the California Department of Motor Vehicles (DMV) and data for private passenger liability insurance reported to the California Department of Insurance (CDI) by insurers. Other methods of evaluating rates of uninsured vehicles, such as studies based upon accident claims, may result in different estimates (California Department of Insurance website).

These data reporting regulations have been in place since 1994. The regulations require insurers to file data annually about where they are and are not writing homeowners, automobile, and commercial policies. These statements, sometimes called "community service statements", disclose the numbers of policies and premiums in each ZIP code in California. The filings do not reveal individual policyholder information.

Pursuant to its authority under Proposition 103, the California Department of Insurance (CDI) promulgated a regulation requiring the public disclosure of the data described above. In 1999, the insurance industry led by State Farm sued claiming that the data constituted a trade secret. Consumers Union and the Southern Christian Leadership Conference of Greater Los Angeles, represented by Public Advocates, intervened in the case because they sought the data in order to track potential redlining abuses by insurers. The San Francisco Superior Court ruled for the groups, finding that the public had a right to review the redlining data under Proposition 103. In a unanimous decision, the First District Court of Appeals affirmed the ruling. While the case was being decided, the CDI continued to collect the data from insurers, but did not make it public. On April 26, 2003 in State Farm v. Garamendi (Case # S102251) the California Supreme Court unanimously ruled that the state insurance commissioner did not exceed his statutory authority under Proposition 103 when he promulgated the public disclosure regulation. The Court noted that regardless of whether the filings contain

trade secrets, the Commissioner's regulation and Proposition 103 make those filings available for public inspection.

ZIP codes are used as the relevant unit of analysis for several reasons. As discussed earlier, the CDI uses them in their analysis and determination of underserved areas. Also, United States census data are reported at the ZIP code level. Therefore, ZIP codes provide a comparable unit of measurement when analyzing the data collected from the census and the CDI. Finally, ZIP codes represent the smallest geographic breakdown there is for insurance data (Klein and Grace, 2001).

Table 1 contains summary data on the portion of drivers in underserved areas, as well as other relevant data. The CDI defines the word "earned" in the term "earned exposure" as a condition where the exposure is recognized by the insurance company after time has passed and the insurance company has delivered the services promised under the insurance policy. Furthermore, an "exposure" is defined as the risk or loss potential an insurance company assumes from its policyholder in exchange for premium (an automobile or home are examples of exposures). "Assigned Risk" is an automobile insurance plan that covers individuals who cannot obtain conventional automobile liability insurance usually because of adverse driving records. These individuals are then placed in a residual insurance market. Insurance companies are assigned to write insurance for them, at higher prices, in proportion to the premiums written in a particular state. These plans protect motorists who suffer injury or property damage through the negligence of bad drivers who otherwise would not have insurance.

California maintains a Low Cost Automobile Insurance Program. The primary goal of this program is to provide affordable liability only auto insurance so that drivers may meet the state's automobile insurance requirements. The state is concerned that too many low income drivers may remain uninsured without this program because the standard insurance premiums are too expensive.

The Low Cost Automobile Insurance Program provides for the following maximum limits on the offered policies:

Bodily Injury liability per person - $10,000;
Bodily Injury liability per accident - $20,000;
Property Damage liability per accident - $3,000.

In order to be eligible for the Low Cost Automobile Insurance Program the following conditions must be met by all applicants:

1. Applicant must be 19 years of age or older and a continuously licensed driver for the past three years;
2. Applicant must qualify as a good driver;
3. Applicant must have a vehicle currently valued at $20,000 or less;
4. Applicant must meet income eligibility requirements determined by household size.

Table 1

Summary Statistics for
Underserved Communities

Coverage	Total Earned Exposures for California	Total Earned Exposures for Underserved Communities	Percentage of Total Earned Exposures in Underserved Communities	Percentage of Total Earned Exposures in Non Underserved Communities
Private Passenger Automobile	19,863,126	1,719,621	8.7%	91.3%
Assigned Risk	66,102	25,167	38.1%	61.9%
Low Cost Auto	4,395	2,511	57.1%	42.9%
Total	19,933,623	1,747,299		

	In California	In Underserved Communities	Percentage in Underserved
Registered Vehicles	23,987,027	2,941,920	12.3%
Population	35,072,540	5,603,855	16.0%
Uninsured Motorist Rate	14.3%	37.9%	
Minority Percentage	55.0%	89.7%	
Per Capita Income (Median)	20,286	11,021	

California Department of Insurance, Statistical Analysis Division

Motivation

It is especially instructive to examine those areas that meet the last two requirements of the underserved criteria, but not the first. That is, those ZIP codes in which the per capita income of the community is below the fiftieth (50th) percentile for California, and the community is predominantly minority, but the proportion of uninsured motorists is *not* ten percentage points above the statewide average. We will investigate these areas to determine whether there are characteristics in these ZIP codes that suggest potential solutions to improving access to automobile insurance in underserved areas. This is important because while previous studies have established that certain demographic groups have a larger percentage of uninsured drivers (Hunstad, 1999), these studies have not examined the issue in the context of underserved markets.

In particular we can assess whether consumers in underserved markets have lower demand for insurance. We will construct a demand model to test various hypotheses related to the demand for insurance in underserved areas. Combining these data with currently available census data may shed light on the reasons that citizens are not purchasing automobile insurance even when they are mandated to do so by law.

By examining this equation we should be able to gain a better understanding of the unique challenges encountered when attempting to provide affordable insurance to underserved communities so that there are fewer ZIP codes on the underserved list when the commissioner delivers the next report. This is important because costs imposed on society by uninsured motorists can be significant (Cole and McCullough, 2007). An Insurance Research Council study found that approximately $2.4 billion, or 6.45% of all paid losses from injury claims, were paid under uninsured motorist coverage in 1997 (Insurance Research Council, 1999). The costs to individuals can be just as severe as the costs to society. In most states, including California, not having access to auto insurance means not being able to drive. This has important ramifications in the context of employment because there is a significant difference in employment rates between car owners and non car owners, particularly in the African-American community (Raphael and Stoll, 2001).

Historical Motivation

The California Department of Insurance promulgated these regulations in part "to promote anti-discrimination so that all have equal access to insurance coverage in California." The CDI felt the need to promulgate these regulations because there is an unfortunate legacy of racial and ethnic discrimination in the United States that we are still grappling with today.

The legal history of these discrimination cases is a long one. Additional analysis conducted by the authors details some of the most important cases in civil rights jurisprudence. This survey of legal precedent is not meant to be completely exhaustive. Rather, this is meant to highlight some important cases in United States history that illuminate why the CDI feels that it is important to promote anti-discrimination. It is important to highlight some of the seminal cases in the jurisprudence of racial discrimination in the United States because from 1938, when the National Association for the Advancement of Colored People (NAACP) won its first Supreme Court victory in a school desegregation case, until the 1960's when we again experienced a political

consensus favoring civil rights, the courts were virtually alone in articulating the importance of race discrimination laws, as well as insisting on their enforcement.

As the cases detailed in the analysis conducted by the authors makes clear, equal access for all to all opportunities is not only desirable it is a minimum requirement if all citizens are to be expected to participate and fully contribute to the well being of society. This holds true whether the issue is access to a public conveyance, access to equal education or access to affordable automobile insurance. The problem of race in general and access in particular has long been a thorny one and difficult to resolve. In creating the underserved designation and requiring the disclosure of the community service statements, the CDI is attempting to provide some measure of relief to those who have been affected by discrimination, whether intentional or not.

California Automobile Insurance Financial Responsibility Requirements

The question of whether or not all citizens in California have adequate access to automobile insurance is an important one because in California proof of "financial responsibility" is required to drive lawfully in the state. Motorists are limited in the manner that they can prove their financial responsibility. The four types of financial responsibility that will be accepted by the California Department of Motor Vehicles (DMV) are provided below:

- A motor vehicle liability insurance policy;
- A cash deposit of $35,000 with DMV;
- A DMV issued self-insurance certificate; or
- A surety bond for $35,000 from a company licensed to do business in California.

Obviously, the vast majority of California motorists will choose to purchase a motor vehicle liability insurance policy to satisfy the financial responsibility requirement.

In 2006, the California Vehicle Financial Responsibility Law changed the way the Department of Motor Vehicles verifies insurance for privately owned vehicles. Changes were made to ensure that vehicles driven on California roads have liability insurance that provides financial responsibility for any damage or injury caused by a traffic accident, regardless of fault, and to remove uninsured vehicles from the highways. Insurance companies in California are required by law (*California Vehicle Code* (CVC) §6058) to electronically report private-use vehicle insurance information to the DMV. Insurance companies are not required to electronically report information for vehicles covered by "commercial" or "business" insurance policies. Customers whose

vehicles are covered by this type of policy will be required to submit paper proof of insurance when required for registration renewal and when a vehicle is registered in their name for the first time in California. Law enforcement and court personnel have electronic access to insurance status on DMV records.

Motorists in California must meet mandatory vehicle registration financial responsibility requirements. Financial responsibility must be obtained and maintained on any vehicle operated or parked on California roadways and must be provided as specified below:

- When requested by law enforcement;
- When renewing vehicle registration (if requested);
- Within 30 days of issuance of a registration card for a vehicle being registered in California for the first time, or transfer of ownership;
- Within 45 days of the cancellation of a policy for a currently registered vehicle;
- When the vehicle is involved in a traffic accident.

Motorists must carry evidence of financial responsibility (proof of insurance) in their vehicles at all times.

California has set minimum liability insurance requirements for private passenger vehicles. The requirements are as follows:

- $15,000 for injury/death to one person;
- $30,000 for injury/death to more than one person;
- $5,000 for damage to property.

Liability insurance compensates a person other than the policy holder for personal injury or property damage (*California Insurance Code §11580.1b*).

California law has set forth a range of penalties in the event that any motorist fails to maintain financial responsibility on a vehicle. If financial responsibility is not maintained the possible penalties are as follows:

- Registration of the vehicle will be subject to suspension. DMV will begin the process to suspend any motorist's registration if:
  — Liability insurance is cancelled and a replacement policy is not submitted within 45 days;
  or
  — The motorist's insurance company has not electronically provided evidence of insurance within 30 days of a registration card being issued on a vehicle being registered in California for the first time;
  or
  — The motorist provides false evidence of insurance.
- The motorist may be cited**.** Failure to provide evidence of financial responsibility when requested by a peace officer may result in a citation with fines that could reach $1,000 or more. (DMV cannot clear or sign citations relating to financial responsibility. Only a court can clear or sign these citations.);
- The vehicle may be impounded**.** Failure to provide evidence of financial responsibility may result in the vehicle being impounded, in addition to any fines;

- The motorist may be personally liable for damages**.** If a motorist contributes to the cause of an accident and cannot provide evidence of financial responsibility, that motorist may be forced to compensate the other party for any injuries and damages.

As the foregoing discussion makes clear, the state of California is serious in insisting that motorists in the state comply with the applicable financial responsibility laws. However, it remains true that many motorists drive without meeting these financial responsibility laws. A California survey found that 10% of vehicle owners in California owned an uninsured vehicle (Hunstad, 1999). Although there are a wide variety of reasons cited by motorists for non-compliance, 80% of uninsured drivers in the survey cited non-use of the vehicle or the cost of insurance as the main reason that they did not insure (Hunstad, 1999). Because insurance is the only practical way for the vast majority of drivers to comply with the financial responsibility law, it is essential that they have affordable access to auto insurance in their area.

Prior Literature

Prior literature has focused on the question of insurance demand. Browne and Hoyt (2000) estimate a flood insurance demand model. They test whether different determinants factor into the decision to purchase flood insurance. These determinants include price, income, recent flood experience, federal government mitigation efforts, and increased federal disaster relief payments. Because they have both time series and cross sectional data, they estimate their model as a fixed effects model. They estimate their model twice in order to account for different definitions of insurance demand. The two definitions are the number of flood insurance policies purchased per 1,000 population in a state during a year and the face amount of flood insurance in force per capita in a state during a year. The number of flood insurance policies in force is a proxy for the number of individuals and businesses that have bought flood insurance coverage. Therefore, it measures the portion of the population that has purchased at least some amount of flood insurance. The face amount of flood insurance in force reveals the total value insured in a state during a year.

For their price variable, they use the dollar value of premiums paid for flood insurance in the state during the year divided by the dollar value of insurance in force (in thousands) in the state during the year. The proxy they use for income is disposable personal income per 1,000 population. They also include a variable to control for the effect that a recent flood might have on a person's feeling about the likelihood of another flood.

They include this variable to account for the likelihood that an individual's perception about the risk of loss may influence the decision to buy insurance. This variable is defined as the dollar value of total flood damage (not just insured losses) in the state during the preceding year.

They ultimately find that flood insurance purchases are positively related to income and negatively related to price. Specifically they find that demand for flood insurance is relatively insensitive to changes in price, but when demand is measured by the amount of insurance in force it becomes sensitive to changes in price. They also find that those with higher income are more likely to purchase insurance and purchase greater amounts of insurance than those with lower incomes. Therefore, this study reinforces the notion that as the level of an individual's income increases, the amount of insurance purchased by that individual is likely to increase. Given the fact that auto insurance is mandatory in many states and flood insurance is not, it will be interesting to expand this notion from the area of flood insurance to the area of auto insurance to determine if this relation still holds true.

The theory of insurance demand has been investigated in other contexts as well. For example, Kunreuther and Pauly (2004) construct an insurance demand model for low probability high loss events. They seek to explain why people often don't buy insurance against low probability high loss events even when it is offered at favorable premiums. They model factors that an individual should consider in deciding whether to consider the purchase of insurance. They show that there are search costs involved with collecting insurance information. These search costs can discourage people from undertaking the type of analysis often necessary to determine that buying insurance against low probability high loss events would often be in their best interest. We can investigate this conclusion in the context of auto insurance by including the language isolated variable. Families that are language isolated face greater search costs than those who aren't because in America most insurance information is written in English. Because these families face greater search costs they should buy less insurance. Kunreuther and Pauly construct two models. In the first model insurers are sure about the probability of loss while consumers are not. In the second model, both insurers and consumers are unsure about the probability of loss.

There have also been several papers focused on the question of access, discrimination and potential redlining in insurance markets. Regarding discrimination, Dane (2006) analyzes the potential racial

implications of using geographic rating territories in the homeowners insurance rating process. He notes that insurance ratemaking has historically been premised on actuarial analysis of loss and claims data that are not known to have racial implications. However, the one area where traditional insurance pricing procedures might have racial consequences is the use of geography. Because many cities in the United States remain racially segregated, there is the potential for racially identifiable neighborhoods in the same city to be charged different rates. Pricing differentials at the small geographic level of the ZIP code have potentially significant racial consequences because if two rating territories that have been created based on ZIP code have different base rates, the chances that two different racial groups will be charged different base rates increases dramatically. Because ZIP codes are so small geographically, generally there is not enough loss data at the ZIP code level to justify the calculation of an actuarially sound base rate. Loss data at the ZIP code level is not credible enough to be the sole basis for generating a base rate. We use the minority variable to try to investigate whether there are any measurable differences in auto insurance demand between different ethnic groups.

Harrington and Niehaus (1998) investigate whether racial discrimination affects the pricing of auto insurance at the market level. They contend that if insurers discriminate, then the expected loss ratio will be lower in areas with a higher percentage of minorities. This would be consistent with higher expected profit margins in these areas. They use ZIP code level data from Missouri for their study.

They define the loss ratio as the average claim costs in a particular ZIP code divided by the average premium per exposure in a particular ZIP code. They use a model that has the log of the loss ratio as the dependent variable and has the percentage of the total population in the ZIP code that is black as an independent variable. The other independent variable is a vector of demographic and other factors. They find that loss ratios are not significantly lower in ZIP codes with larger minority populations. They reason that this finding implies that higher auto insurance premiums in urban areas are attributable to high claim costs in these areas and not to discrimination.

Squires and Kubrin (2006) reach a different conclusion by examining the historical and ongoing practices of racial profiling and other discriminatory actions in the property insurance industry. They detail how important insurance is to people in their everyday life. They assert that households that confront the problem of insurance availability tend to be located in inner city neighborhoods where there are high concentrations of non-

white residents. They contend that inner city residents must deal with a host of factors not relating to risk that causes them to have insurance availability problems. They point out that insurers don't know the cost of their product when it is sold to the consumer because they can't know whether or not any particular consumer will ever file a claim. Therefore, the authors contend that as part of their underwriting practices, insurers use race as a way to classify and price risks. Their contention is that many residents of urban areas are offered less attractive insurance products for reasons unrelated to the actual risk that they pose to the insurance company. They detail many factors that could have an adverse effect on the ability of urban residents to procure insurance. These factors include agent location, underwriting guidelines, and the claims process. The authors advocate state programs that would establish an affirmative obligation for insurers to provide insurance products and investment activity in low and moderate income neighborhoods. They also urge the adoption of a federal insurance disclosure requirement to force insurers to reveal the areas where they are writing their insurance policies.

Klein and Grace (2001) analyze the urban homeowners insurance market in Texas to determine whether insurance firms are redlining. They assess whether there is significant statistical evidence to prove the existence of redlining. Their paper controls for other factors that affect market outcomes thereby avoiding the omitted variable bias that occurs in prior literature because the effects of race are confounded with other factors correlated with race. They begin by discussing the general conditions in urban insurance markets focusing on the differences between metropolitan and nonmetropolitan areas. They compare data on insurance prices and claim costs in the three largest Texas metropolitan areas with nonmetropolitan areas in the state. They find that metropolitan homeowners pay higher average premiums for insurance than homeowners in nonmetropolitan areas for both fire and multi-peril coverage. However, they do not conclude that metropolitan homeowners are being overcharged because the loss costs in metropolitan areas are greater than the loss costs in nonmetropolitan areas.

They examine claim costs because this is a prime way to determine the pricing efficiency in urban areas. They assert that if claim costs are higher in areas with a higher concentration of minorities, then it is reasonable to expect that these areas will have to pay higher prices for insurance. They ask 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 an additional effect that may be accounted for by recognizing the existence of unfair discrimination. To investigate this question they use a model that has a dependent variable of average claim costs. The independent variables include a variable to proxy for the sensitivity of claims costs to the percentage of Blacks and Hispanics in a ZIP code. The other independent variables in the model include several economic, demographic, and housing variables. They use variables to proxy for risk of loss, volatility in homeowners' claims, and supply of and demand for insurance.

They find no significant relation between claim costs and the percentage of minorities in a ZIP code. They find that as owner occupancy increases, claim costs decrease. They also find that as the total wealth of the ZIP code increases, average claim costs decrease. Furthermore, they find that the percentage of minorities in a ZIP code is not statistically related to the loss ratio. These findings lead them to conclude that no statistical evidence of redlining exists and that the risk of loss and the demand for insurance appear to primarily drive the terms of insurance transactions.

Harrington and Niehaus (1992) analyze a California program that seeks to deal with insurance unavailability and affordability problems in urban areas. The California program gives the insurance commissioner discretion to adjust the allowable rate of return depending on the amount of business that an insurer writes in inner city areas. After discussing possible sources of availability and affordability problems and describing the California proposal, the authors conclude that the program suffers from severe defects. These regulations would provide an incentive for some insurers to reduce quality or exit from the California market. The authors contend that the regulations would also promote cross-subsidies that would make consumers in other areas pay more to finance the urban areas.

Cole and McCullough (2007) investigate the uninsured motorist problem and provide a survey of some possible solutions. They explain the gravity of this problem by noting how the uninsured motorist rate has been increasing in recent years. They go on to detail the many different approaches that have been tried to deal with this problem. The approaches include improving tracking techniques designed to enforce compulsory insurance and financial responsibility laws, the availability of low-cost automobile insurance policies, the creation of uninsured and underinsured motorist coverage, the implementation of no pay, no play laws, and proposals for

pay at the pump laws. The authors point out that increased understanding of the uninsured motorist problem through future studies will help identify the most cost effective solutions.

This study follows in that tradition by examining the uninsured motorist problem through the prism of access. California is attempting to help alleviate the uninsured motorist problem by providing its more underserved citizens with increased access to much needed insurance. This study will contribute to that strategy by focusing on identifying what factors lead to greater auto insurance demand. The results of this study will help policymakers in the future as they design their own strategies to deal with the problem of the uninsured motorist.

Econometric Model and Data

The data used in this study is cross-sectional in nature and we are interested in its impact in determining whether these areas will be categorized as underserved or almost underserved. The models are estimated using the method of ordinary least squares. We combine data from the US Census Bureau's 2000 census and insurance data for 2004 collected by the California Department of Insurance. Following Butler (1994), we log the explanatory variable insurance demand to reduce the positive skewness in the regression's error term. Insurance demand is defined as (1 - uninsured motorist rate). The uninsured motorist rate is calculated by subtracting the number of insured vehicles from the number of registered vehicles and dividing this difference by the number of registered vehicles.

In order to investigate auto insurance demand it is necessary to examine certain factors that are likely to have an affect on a typical consumer's demand for auto insurance. In particular, we can focus on the question of which factors have a greater influence in determining whether a particular area in California will end up meeting the entire definition set forth by the California Department of Insurance and thereby be deemed underserved.

We follow Browne and Hoyt (2000) for the structure of the model and Klein and Grace (2001) for many of the variables included in the final equation. The variables in the model were chosen based on demographic relevance and previous literature. All of the demographic factors used in previous literature like Klein and Grace (2001) that are relevant to the automobile insurance market have been included in the model used in this study.

Other variables such as the theft and Asian variables are considered in separate analysis conducted by the authors. The theft variable is not included in the main model because several counties did not report motor vehicle theft data to the California Department of Justice. Therefore, including this variable in the main model would have necessitated the omission of nearly 200 ZIP codes. The Asian variable is not included in the main model because its inclusion would have introduced a significant level of multicollinearity into the model.

The model is specified as follows:

$$\text{Log(Insurance Demand)} = \beta_0 + \beta_1 \text{ (Urban)} + \beta_2 \text{ (Minority)} + \beta_3 \text{ (Per Capita Income)} + \beta_4 \text{ (Poverty)}$$
$$+ \beta_5 \text{ (Language Isolated)} + \beta_6 \text{ (High School)} + \beta_7 \text{ (Hispanic)}$$

Urbanization

We include a binary variable to capture the effect that an urban ZIP code would have on the demand for automobile insurance. Demand for automobile insurance in urban areas is different than the demand in rural areas (Cummins and Tennyson, 1992). Using a binary variable is admittedly a crude measure of urbanization, but it is the best possible measure that can be used. The difficulty is due to the nature of ZIP codes. ZIP codes are a convenience for the United States Postal Service. They were invented for the sole purpose of allowing the mail to be delivered more accurately and efficiently. They don't necessarily have defined boundaries. ZIP codes do not represent geographic regions; they generally correspond to address groups or delivery routes. Consequently, ZIP code "areas" can overlap, be subsets of each other, or be artificial constructs with no geographic area. Therefore, it is very difficult to calculate even basic statistics like square footage for many ZIP codes. The difficulty this creates for our purposes is that we can't calculate a reliable area for these ZIP codes to compare against the population measure that we have from the census data. Therefore, we are reduced to using the binary variable so that we have at least an approximation of urbanization in the model. The US Census Bureau defines an urban area as: "Core census block groups or blocks that have a population density of at least 1,000 people per square mile (386 per square kilometer) and surrounding census blocks that have an overall density of at least 500 people per square mile (193 per square kilometer)." Using this metric, ZIP codes in the counties of San Francisco, Orange, Los Angeles, Alameda, San Mateo, Sacramento, Santa Clara, Contra Costa, San Diego, and Santa Cruz all qualify as urban.

The expectation is that urbanization will have a negative impact on demand for automobile insurance perhaps due to the fact that more people per capita live in these areas so accidents are more likely. It has also been observed that automobile insurance claiming behavior is different in large metropolitan areas than in more rural areas (Cummins and Tennyson, 1996). Also, the ratio of bodily injury claim frequency to property damage claim frequency is usually much higher in urban areas. The ratio is more than twice as high in Los Angeles and New York than their individual state averages and in Philadelphia the ratio is more than three times higher than the state average (Hoyt, Mustard and Powell, 2006). This leads to higher premiums in urban areas because claim costs are higher and higher premiums lead to lower demand for insurance (Harrington and Niehaus, 1992).

Minority

The variable Minority refers to the percentage of Blacks and non-Black Hispanics in a ZIP code. We expect that a higher concentration of minorities in a ZIP code will have a negative effect on demand for automobile insurance due perhaps to a lack of income and a lack of awareness about mandatory insurance laws. Also, minorities tend to be more concentrated in urban areas. Therefore, the level of minorities in a ZIP code may reflect the level of urbanization in the ZIP code. *Ceteris paribus*, urban ZIP codes will have higher premiums than non urban ZIP codes due to higher claim costs (Harrington and Niehaus, 1998).

In other contexts it has been shown that there are disparities in access to insurance among different racial groups. Weinick, Zuvekas, and Cohen studied trends in disparities and access to health care services. In each of the years that they studied (1977-1996) they found that Hispanic and African Americans were considerably more likely to lack a usual source of care than white Americans (Weinick, Zuvekas, and Cohen, 2000).

This variable will also be instructive in determining if the business practices of insurers in California are resulting in a "disparate impact" against minorities. If a business practice has a disparate impact on minorities it can be legally impermissible even if it is racially neutral on its face. If a policy or practice is shown to have such an effect, even if it is unintended, then the policy or practice is illegal unless the insurer can show that there is a compelling business justification for the policy or practice, and that no less discriminatory alternative exists to achieve the same business purpose (Dane, 2006; *Metropolitan Housing Development Corp. v. Village of Arlington Heights*, 558 F.2d 1283, 1977).

Income

From the 2000 census conducted by the United States Census Bureau we have data on per capita income for each ZIP code. There is evidence in prior literature that supports the proposition that per capita income will be positively correlated with insurance demand (Klein and Grace, 2001). Those households with more discretionary income will likely have more willingness and certainly have more ability to purchase insurance. Consumers with higher income are also more likely to have an understanding of the importance of purchasing insurance and how such a purchase can protect them and their property. Higher income consumers will also be more likely to have more wealth at risk from lawsuits and will therefore perceive the value of having liability insurance (Harrington and Niehaus, 1992). In other contexts income has been found to play a role in access to insurance. Income has been found to be a factor in explaining disparities in access to health care and health insurance between ethnic minorities and whites. Income was found to be important in explaining disparities in two main areas: having a usual source of care and family perceptions of access to health care (Zuvekas and Taliaferro, 2003).

The income variable can also be used to investigate the question of whether automobile insurance in the California market exhibits the characteristics of an inferior good. An inferior good is a good in which demand decreases as a consumer's income rises. With a normal good, the reverse is true. There is support in prior literature for the proposition that insurance is an inferior good (Mossin, 1968). If insurance is in fact an inferior good we will observe a negative correlation between insurance demand and the income variable. Because of this conflict in the theory I am unsure whether the income variable will be positively or negatively correlated with insurance demand.

Poverty

From the 2000 census conducted by the United States Census Bureau we have data on the percentage of families living below the poverty level in each ZIP code. The rationale here is the reverse of the one made above when dealing with those with high incomes. The percentage of families living in poverty should be negatively correlated with insurance demand likely due to the fact that these families will have fewer funds to spend on insurance (Klein & Grace, 2001). These families will also have little if any discretionary income and

probably will have a hard time affording insurance when they have to worry about having money to pay for basic needs like food, clothing and shelter (Harrington and Niehaus, 1992).

This variable will also help us determine whether certain areas are underserved because they have a high concentration of minorities or because the people in these areas don't have enough money to pay for adequate insurance (Squires, 2003). In essence, this variable will help us determine how much of the decreased demand in underserved areas is due to uninsured, working poor drivers.

Language Isolated

From the 2000 census conducted by the United States Census Bureau we have data on the percentage of households that are language isolated. Households are considered to be language isolated if English is not the primary language spoken inside the home. This variable will allow us to identify the effect of language in purchasing auto insurance. This is important because in California, uninsured motorists are more likely to be Hispanic or African-American (Hunstad, 1999).

The percentage of families that are language isolated should also be negatively correlated with insurance demand because these families are probably less likely to be aware of the necessity of purchasing auto insurance. Language isolated families also may have a more difficult time shopping around and purchasing insurance (Klein & Grace, 2001). For example, the internet is a vehicle that many people use to purchase insurance. If the ultimate purchase is not done on the internet many consumers still use the internet as a tool for researching their insurance needs and for comparison shopping. Since most – if not all – of the relevant insurance websites are in English, being language isolated represents a significant barrier to properly using the internet as a mechanism for purchasing insurance.

Language has been found to be an important factor in determining health care use. Previous studies have shown that the use of heath care for English speaking Hispanic patients was not significantly different than for non-Hispanic patients. However, Spanish speaking Hispanic patients were shown to be significantly less likely to have had an array of health services than non-Hispanic white patients. These services included physician visits, mental health visits, and influenza vaccinations (Fiscella, et al, 2002).

Language is also subjectively seen as a problem by many Latinos. One study that investigated access barriers to health care found that 26% of Latino parents thought that language problems were the single greatest

barrier to obtaining heath care for their children. Another 15% said that the greatest obstacle was doctors and nurses who don't speak Spanish. Additionally, another 11% mentioned lack of interpreters as the biggest problem (Flores et al, 1998).

High School Education

The percentage of adults with at least a high school education should be positively correlated with insurance demand. This metric reveals which consumers are more educated. Those consumers with higher education should better understand the necessity of buying insurance. Those consumers with less education may also feel less comfortable buying insurance because purchasing insurance requires consumers to pay premiums for a benefit that they may only realize in the future if at all. Consumers with less education may be less willing to see this type of purchase as valuable (Klein & Grace, 2001). Previous studies have found that uninsured drivers are more likely to have less than a high school education (Hunstad, 1999). This variable will allow us to test that finding with our new data.

In other contexts education has been found to be a factor in explaining racial and ethnic disparities in ambulatory care use (Zuvekas and Taliaferro, 2003). The education level of parents has also been found to have an impact in explaining the likelihood of children having health insurance. Children were more likely to be privately insured and less likely to be publicly insured or uninsured if their parents had a higher level of education. Specifically, children who had parents with more than twelve years of education were most likely to have private insurance and least likely to be uninsured (Weinick, Weigers, and Cohen, 1998).

Hispanic

The Hispanic variable reports the percentage of people in each ZIP code who claimed that they were of Hispanic descent. On the 2000 United States Census form the Hispanic question is distinct from the race question. Specifically, the Hispanic question asks respondents if they are Spanish, Hispanic, or Latino. A separate question on race asks respondents what race they consider themselves. Both questions rely on self-identification. Therefore, for purposes of the Census a person can be both Hispanic and black or Hispanic and white or Hispanic and Asian or Hispanic and some other race (US Census Bureau, Census 2000). The Census uses the terms "Hispanic" and "Latino" interchangeably. This study will only use the term "Hispanic" to avoid any confusion.

California as a whole is home to 13,160,978 people who identify themselves as Hispanic, or 36.1% of California's total population (U.S. Census Bureau, 2006-2008 American Community Survey). This is more than double the percentage of Hispanics found in the United States as a whole (15.1%). Because of the significantly higher percentage of Hispanics in California, it is important to account for it separately in our analysis. It will also be interesting to explore whether the Hispanic variable will be demonstrably different from the language isolated variable in our analysis. Our priors are that the effect will be similar to the language isolated variable, so we predict that the Hispanic variable will be negatively correlated with insurance demand. Table 2 lists the explanatory variables included in our model and the predicted signs.

Table 2

Summary of the Predicted Signs
of the Regression Coefficients

Variable	Definition	Hypothesized Sign
Minority	% of minority population in each ZIP code	-
Per Capita Income	Per Capita Income in each ZIP code	+/-
Poverty	% of families below poverty level in each ZIP code	-
Language Isolated	% of families that don't speak English as a first language in each ZIP code	-
High School	% of adults with at least a high school education in each ZIP code	+
Urban	Binary variable with a value of 1 if the ZIP code is urban and 0 if not	-
Hispanic	% of people in each ZIP code who claimed Hispanic descent	-

Table 3 reports the results of a difference in means test performed on the underserved and almost underserved datasets. The difference in all cases is the underserved dataset minus the almost underserved dataset.

Table 3

Difference in Means Tests (Underserved v. Almost Underserved)

	Mean		
Variable	Underserved	Almost Underserved	Direction, Statistically Different
Minority	.8898	.7978	+ ***
Poverty	.2508	.1699	+ ***
Language	.6736	.5803	+ ***
High School	.4800	.5999	- ***
Income	11,334.55	13,687.29	- ***
Demand	1.8438	2.2865	- ***

Results

Table 4 reports the correlation matrix and the variance inflation factors for each of the variables in the model for the underserved ZIP codes. The matrix supports the predictions made in Table 4 regarding the relationship between demand and the other variables in the model.

Table 4

Correlation Matrix of Model Variables in Underserved ZIP codes

	Demand	Urban	Hispanic	Minority	Income	Poverty	Language	High School
Demand	1.0000							
Urban	-0.2365	1.0000						
Hispanic	0.0526	-0.2211	1.0000					
Minority	-0.3019	0.2507	0.4043	1.0000				
Income	0.3252	0.3627	-0.5544	-0.3927	1.0000			
Poverty	-0.5420	-0.2084	0.1622	0.2911	-0.7159	1.0000		
Language	0.0466	0.0489	0.8047	0.3688	-0.3498	0.0992	1.0000	
High School	0.2164	0.2812	-0.8108	-0.5021	0.7810	-0.5074	-0.6685	1.0000

Table 5 reports the results from the underserved ZIP codes. The underserved ZIP codes are those ZIP codes in which the proportion of uninsured motorists is ten percentage points above the statewide average, the

per capita income of the community (as measured in the most recent U.S. Census), is below the 50th-percentile for California, and the community (as measured in the most recent U.S. Census), is predominantly minority.

Table 5

Results from Insurance Demand Model on Underserved ZIP codes

Variable	Coefficient	Standard Error	t-stat	P>|t|	Expected Sign	VIF
Urban	-.2127642	.0467522	-4.55	0.000	-	1.76
Hispanic	.1382657	.1965803	0.70	0.483	-	5.98
Minority	-.0712257	.201547	-0.35	0.724	-	1.78
Income	1.34e-06	.0000155	0.09	0.931	+/-	4.51
Poverty	-1.251045	.3295442	-3.80	0.000	-	2.69
Language	.3538241	.1669982	2.12	0.036	-	3.69
High School	.5706342	.3521216	1.62	0.107	+	6.69
Intercept	1.763572	.4300764	4.10	0.000		

n = 145
R^2 = .4645

The results reported in Table 5 provide some support for the previously stated hypotheses. The result for the poverty variable is statistically significant and consistent with our hypotheses. Therefore, these results provide some support for the proposition that ZIP codes with lower income experience lower demand for auto insurance even though the income variable is inconclusive. The urbanization variable also conforms to our expectations and is statistically significant. This may be due to the fact that urban areas tend to have an increased number of lower income people who have trouble affording insurance. The language variable is significant and contrary to our expectations. The coefficient estimates for the high school variable, the income variable, the minority variable, and the Hispanic variable are not statistically different from zero.

Table 6 reports the correlation coefficients for each of the variables in the model for the almost underserved ZIP codes. Table 7 reports the results from those ZIP codes in which the per capita income of the community (as measured in the most recent U.S. Census) is below the 50th-percentile for California and the community (as measured in the most recent U.S. Census) is predominantly minority and yet the ZIP code is not underserved because the proportion of uninsured motorists is not ten percentage points above the statewide average.

Table 6

Correlation Matrix of Model Variables in Almost Underserved ZIP codes

	Demand	Urban	Hispanic	Minority	Income	Poverty	Language	High School
Demand	1.0000							
Urban	-0.0925	1.0000						
Hispanic	-0.0869	-0.4814	1.0000					
Minority	-0.0218	0.0024	0.3373	1.0000				
Income	0.0040	0.6281	-0.5367	-0.3299	1.0000			
Poverty	-0.1453	-0.3187	0.2008	0.1920	-0.5223	1.0000		
Language	-0.0963	-0.0476	0.6371	0.6663	-0.3296	0.0703	1.0000	
High School	0.0883	0.5355	-0.7824	-0.4596	0.7601	-0.4833	-0.6485	1.0000

Table 7

Results from Insurance Demand Model on Almost Underserved ZIP codes

Variable	Coefficient	Standard Error	t-stat	P>|t|	Expected Sign	VIF
Urban	-.1047831	.0334258	-3.13	0.002	-	2.23
Hispanic	-.1766486	.2006216	-0.88	0.380	-	3.34
Minority	.353107	.4530652	0.78	0.437	-	1.69
Income	-5.57e-06	.0000106	-0.52	0.602	+/-	3.20
Poverty	-.6533843	.3690001	-1.77	0.079	-	2.69
Language	-.1158647	.2557377	-0.45	0.651	-	3.90
High School	.1100983	.3152558	0.35	0.727	+	6.64
Intercept	2.341725	.3455357	6.78	0.000		

n = 136

R^2 = .0717

The results reported in Table 7 provide some confirmation for our previously stated hypotheses. The coefficient for the urban variable is negative and significant. This result supports our expectation that urbanization will have a negative impact on demand for automobile insurance. The coefficient for the poverty variable is also negative and significant which is in line with our previously stated hypothesis. The other variables are not significant.

It is interesting to consider the underserved and almost underserved ZIP codes in conjunction with one another. In both of the underserved and almost underserved datasets, the urban variable and the poverty variables are negative and significant. In both cases this is consistent with our expectations and our previously stated hypotheses.

The language variable for the underserved ZIP codes is positive and significant which is contrary to our expectations. Perhaps this is due to an increased number of families with bilingual family members or an effort by insurance firms in heavily Hispanic areas of California to advertise in Spanish in order to reach this segment of the market.

The minority, high school, income, and Hispanic variables are not significant in either sample. Because the minority variable is inconclusive we are unable to find support for Dane's concern that racially identifiable neighborhoods in the same city may be charged different rates.

Table 8

Correlation Matrix of Model Variables in Underserved and Almost Underserved ZIP codes

	Demand	Urban	Hispanic	Minority	Income	Poverty	Language	High School
Demand	1.0000							
Urban	-0.2847	1.0000						
Hispanic	-0.1394	-0.2822	1.0000					
Minority	-0.4187	0.2291	0.4153	1.0000				
Income	0.3341	0.3781	-0.5655	-0.4525	1.0000			
Poverty	-0.5231	-0.1211	0.2402	0.3933	-0.6679	1.0000		
Language	-0.2055	0.0750	0.7443	0.5441	-0.3991	0.1965	1.0000	
High School	0.3766	0.2614	-0.7927	-0.5752	0.7976	-0.5822	-0.6915	1.0000

Table 9

Results from Insurance Demand Model on Underserved and Almost Underserved ZIP codes

Variable	Coefficient	Standard Error	t-stat	P>|t|	Expected Sign	VIF
Urban	-.274689	.0364519	-7.54	0.000	-	1.82
Hispanic	.0376104	.2031006	0.19	0.853	-	4.22
Minority	-.2335388	.1998632	-1.17	0.244	-	2.04
Income	3.81e-07	.0000145	0.03	0.979	+/-	3.89
Poverty	-1.269234	.4691928	-2.71	0.007	-	2.29
Language	.3549792	.1448801	2.45	0.015	-	3.35
High School	.8211676	.3068362	2.68	0.008	+	7.47
Intercept	1.999073	.4657944	4.29	0.000		

n = 281

R^2 = .4416

Table 8 reports the correlation coefficients for each of the variables in the model for the underserved and almost underserved ZIP codes. Table 9 reports the results obtained when the underserved ZIP codes and the

almost underserved ZIP codes are combined together into one sample. The urban variable continues to be negative and significant indicating that people in urban areas are less likely to demand auto insurance. The poverty variable is negative and significant. This result is consistent with what was observed previously and it is also consistent with our expectations. The language variable continues to be positive and consistent which is contrary to our expectations. The high school variable is positive and consistent which is what we expected. It is interesting that the high school variable is significant in the combined dataset, but it is not significant in either the underserved or almost underserved datasets when they are considered separately. An examination of the minority, income, and Hispanic variables reveals that they are insignificant here like they were in the previous specifications.

In order to provide further context, it is important to investigate the entire universe of California ZIP codes. The remaining analysis will concentrate on all of the ZIP codes in California on which the California Department of Insurance collected data and which had more than 200 residents as reported by the 2000 United States Census. The hypotheses discussed above remain the same for the data containing all of the California ZIP codes.

Table 10 reports the correlation matrix for all of the included ZIP codes in California. The matrix supports the predictions made regarding the relationship between demand and the other variables in the model. We can make some other observations based on the correlation matrix in Table 10. The Hispanic variable is positively correlated with the minority and language isolated variable but negatively correlated with the high school variable. The minority and language isolated variables are also positively correlated.

Table 10

Correlation Matrix of Model Variables for all California ZIP codes

	Demand	Urban	Hispanic	Minority	Income	Poverty	Language	High School
Demand	1.0000							
Urban	-0.1792	1.0000						
Hispanic	-0.4929	0.0341	1.0000					
Minority	-0.5265	0.3087	0.8253	1.0000				
Income	0.2324	0.3203	-0.5265	-0.4600	1.0000			
Poverty	-0.4299	-0.1239	0.5667	0.5328	-0.5700	1.0000		
Language	-0.5115	0.3242	0.8510	0.8900	-0.3341	0.4671	1.0000	
High School	0.5414	0.1036	-0.8825	-0.7470	0.6444	-0.7350	-0.7547	1.0000

Table 11 reports the results for the full universe of ZIP codes with all of the variables included in the model.

Table 11

Results from Insurance Demand Model on all California ZIP codes

Variable	Coefficient	Standard Error	t-stat	P>|t|	Expected Sign	VIF
Urban	-.1223736	.0249196	-4.91	0.000	-	1.96
Hispanic	.2601951	.1117203	2.33	0.020	-	7.89
Minority	-.3910937	.1098155	-3.56	0.000	-	6.63
Income	-4.88e-06	1.82e-06	-2.69	0.007	+/-	2.26
Poverty	-.4141546	.215578	-1.92	0.055	-	2.46
Language	.112872	.1386286	0.81	0.416	-	7.87
High School	1.472561	.2967999	4.96	0.000	+	8.50
Intercept	1.59356	.2356907	6.76	0.000		

n = 1553

R^2 = .3714

The results presented in Table 11 reveal that the urban and minority variables remain negative and significant which is as expected. The high school variable is positive and significant which is also in line with expectations. The Hispanic variable is positive and significant which is contrary to expectations. This may be due to the fact that California has such a high Hispanic population that there is plenty of insurance advertising in both Spanish and English so everyone is more aware of the importance of purchasing automobile insurance. The language isolated variable is not significant. It is interesting that the Hispanic variable is positive and significant and the language isolated variable is not significant. This may be due to the fact that there are many people in the Hispanic community who are bilingual. Also, as noted above, California is 36.1% Hispanic which means that there is strong incentive for insurers to court the Hispanic market in order to convince them of the need to purchase insurance. This outreach includes Spanish language advertising so the fact that a family may be language isolated would be rendered much less important.

With regard to the two explicitly economic variables we get interesting results. The poverty variable is negative and significant which matches our expectations. However, the income variable is negative and significant. This result seems to confirm Mossin's contention that insurance is an inferior good.

Table 12 presents the results of several models. All of the models have insurance demand as the dependent variable. The models have different independent variables in order to explore the interactions between the variables. Specifically, there are some variables in the complete model that have relatively high correlations. For example, in model 2, the High School variable was deleted because of its high correlation with the Hispanic variable. In model 3, the Language variable was deleted because of its high correlation with both the minority and the Hispanic variable. In model 4, the Language and High School variables were deleted because of their high correlations with the Hispanic and Minority variables. In model 5, the Minority variable was deleted because of its high correlation with the Hispanic, Language, and High School variables. All of the regressions reported in Table 12 were performed on the dataset containing all of the California ZIP codes.

Table 12

Results from Selected Insurance Demand Models on all California ZIP codes

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Urban	-.1223736	-.0736853	-.1156684	-.0808134	-.1582557	-.1231787
	[.0249196]***	[.0319434]**	[.0288837]***	[.0340751]**	[.0207523]***	[.0251033]***
Hispanic	.2601951	-.2808984	.2982317	-.348806	.1551071	.3214595
	[.1117203]**	[.092757]***	[.1307203]**	[.0718988]***	[.1021099]	[.1003049]***
Minority	-.3910937	-.3359965	-.3433327	-.3965755		-.4290201
	[.1098155]***	[.1078165]***	[.0711541]***	[.0802178]***		[.1000923]***
Income	-4.88e-06	-2.57e-06	-4.62e-06	-2.84e-06	-3.53e-06	-4.63e-06
	[1.82e-06]***	[5.79e-07]*	[1.59e-06]***	[1.39e-06]**	[1.56e-06]**	[1.88e-06]***
Poverty	-.4141546	-1.169928	-.4327324	-1.171048	-.5183771	
	[.215578]*	[.1915749]***	[.2034048]**	[.1949671]***	[.2033243]***	
Language Isolated	.112872	-.1390726			-.1426441	.1490397
	[.1386286]	[.1180199]			[.0910867]	[.1291406]
High School	1.472561		1.434694		1.428258	1.693702
	[.2967999]***		[.2658697]***		[.2921763]***	[.2200346]***
Intercept	1.59356	2.934575	1.619121	2.946239	1.553625	1.36007
Observations	1553	1553	1553	1553	1553	1553
R^2	.3714	.3303	.3709	.3296	.3626	.3680

Note: The dependent variable is insurance demand. Standard errors appear in brackets below each coefficient estimate. ***,**, and * denote statistical significance at the 1, 5, and 10 percent levels respectively.

When examining the variables contained in the various models a few things are revealed. The first thing that stands out is the Hispanic variable. Throughout all of the models the Hispanic variable displays a lack of consistency. In three of the models it is positive and in two it is negative and in one it is insignificant. The

Hispanic variable is not only the sole one that demonstrates this level of inconsistency, it is the only one that demonstrates any inconsistency at all. Every other variable is always positive or always negative.

The urban and minority variables are negative and consistent at the 1% level in every specification in which they appear (except for the urban variable in model 2). The high school variable is positive and consistent at the 1% level in every specification in which it appears. The poverty and language isolated variables never change their sign but are insignificant in some specifications.

The income variable is negative and consistent in every specification. These results continue to indicate that income has a negative correlation with automobile insurance demand when all ZIP codes in California are considered. Therefore, the result found when considering the entire California market provides evidence in agreement with previous literature that concluded that insurance is an inferior good.

Overall, with the previously noted exception of the Hispanic variable all of the other variables in the different specifications demonstrated remarkable consistency. Table 12 suggests that even in the face of some rather high correlation reported in Table 10 the results can be regarded with some degree of trust. This should bolster our confidence when interpreting the effect of the various variables on automobile insurance demand. With the exception of the Hispanic and the income variable, all of the remaining variables are in line with our hypotheses.

Table 13 presents the results when all of the variables in the main model are regressed against insurance demand separately.

Table 13

Results from Single Variable Insurance Demand Models on all California ZIP codes

Variable	Coefficient	Standard Error	t-stat	P>|t|	Expected Sign	N	R^2
Urban	-.146621	.0212883	-6.89	0.000	-	1562	0.0311
Intercept	2.512509	.012028	208.89	0.000			
Hispanic	.2601951	.1117203	2.33	0.000	-	1553	0.2429
Intercept	2.673335	.0139745	191.30	0.000			
Minority	-.3910937	.1098155	-3.56	0.000	-	1562	0.2756
Intercept	2.829218	.0171208	165.25	0.000			
Income	-4.88e-06	1.82e-06	-2.69	0.000	+/-	1562	0.0547
Intercept	2.278578	.0254562	89.51	0.000			
Poverty	-.4141546	.215578	-1.92	0.000	-	1562	0.1794
Intercept	2.660896	.0192021	138.57	0.000			
Language	.112872	.1386286	0.81	0.000	-	1561	0.2572
Intercept	2.736481	.0142284	192.32	0.000			
High School	1.472561	.2967999	4.96	0.000	+	1561	0.2893
Intercept	1.397044	.0428268	32.62	0.000			

The results reported in Table 13 are largely in agreement with the previously reported results. The coefficients for the urban, minority, income, and poverty variables remain negative while the coefficients for the Hispanic, language, and high school variables remain positive.

Table 14 summarizes the results found in the various models that contained all of the independent variables. The underserved column presents the results from the underserved ZIP codes only. The almost column presents the results from only the almost underserved ZIP codes. The combined column presents the results from the dataset that combines the underserved and the almost underserved ZIP codes. The California column presents the results from all of the ZIP codes in California that had a population of 200 or more people according to the 2000 United States Census.

Table 14

Summary of Results from Complete Insurance Demand Model on All Samples

	Underserved	Almost	Combined	California	Expected Sign
Urban	-.2127642	-.1047831	-.274689	-.1223736	-
	[.0467522]***	[.0334258]***	[.0364519]***	[.0249196]***	
Hispanic	.1382657	-.1766486	.0376104	.2601951	-
	[.1965803]	[.2006216]	[.2031006]	[.1117203]**	
Minority	-.0712257	.353107	-.2335388	-.3910937	-
	[.201547]	[.4530652]	[.1998632]	[.1098155]***	
Income	1.34e-06	-5.57e-06	3.81e-07	-4.88e-06	+/-
	[0000155]	[.0000106]	[.0000145]	[1.82e-06]***	
Poverty	-1.251045	-.6533843	-1.269234	-.4141546	-
	[.3295442]***	[.3690001]*	[.4691928]***	[.215578]*	
Language Isolated	.3538241	-.1158647	.3549792	.112872	-
	[.1669982]**	[.2557377]	[.1448801]**	[.1386286]	
High School	.5706342	.1100983	.8211676	1.472561	+
	[.3521216]	[.3152558]	[.3068362]***	[.2967999]***	
Intercept	1.763572	2.341725	1.999073	1.59356	
Observations	145	136	281	1553	
R^2	.4645	.0717	. 4416	. 3714	

Note: The dependent variable is insurance demand. Standard errors appear in brackets below each coefficient estimate. ***,**, and * denote statistical significance at the 1, 5, and 10 percent levels respectively.

Conclusion

In California a significant portion of the automobile insurance market remains underserved. California has tried to remedy this problem by promulgating regulations to improve the availability and affordability of insurance in these underserved areas. This analysis of automobile insurance demand in these underserved areas and in almost underserved areas provides some support for several hypotheses that attempt to explain why some areas remain underserved.

The analysis consistently suggests that both poverty and urbanization have negative impacts on the demand for automobile insurance. People living in poor urban areas are less likely to have a demand for auto insurance. This may be due to the fact that individuals in these areas can't afford to buy insurance or don't appreciate the value of insurance. Insurance may not have enough value to them to justify the premiums because they may feel that the vehicle that they own is not worth enough to insure (Hunstad, 1999). We may also be observing less demand in urban areas because people in these areas are more likely to have access to

public transportation and therefore feel that they don't need automobile insurance because they don't drive as much.

These findings provide evidence consistent with Harrington and Niehaus (1998). In underserved and almost underserved areas the results suggest that the percentage of minorities present in a ZIP code has no statistical effect on automobile insurance demand. Even though there is evidence that the minority status of a ZIP code matters in assessing insurance demand for California as a whole; it is still consistent with the data to assert that it is the economic condition of a particular ZIP code which has more impact on automobile insurance demand.

The income level of a particular ZIP code was found to be inconclusive in helping to predict the level of automobile demand except when considering California as a whole. When examining the entire state the level of income of a ZIP code was found to be inversely related to insurance demand. In California as a whole, the results suggest that the higher the income level in a particular ZIP code the lower the insurance demand. This result confirms prior literature that contended that insurance is an inferior good. However, it is inconsistent with Browne and Hoyt (2000).

The high school variable was found to be positively correlated with insurance demand in California as a whole and in the combined sample. This result is consistent with expectations and with Klein & Grace (2001) and Hunstad (1999).

Another factor that was observed to have an impact on insurance demand in underserved communities was whether or not the household was language isolated. In the almost underserved ZIP codes and in California as a whole this variable was inconclusive. However, in the underserved ZIP codes this variable was positive and significant. It is useful to consider the language isolated variable in conjunction with the Hispanic variable. These two factors should be somewhat related because after English the next most popular language spoken in the home is Spanish. Like the language isolated variable, the Hispanic variable was contrary to expectations. The Hispanic variable was positive for California as a whole. It was inconclusive in the other samples.

While this result was contrary to expectations, and previous research (Kunreuther and Pauly, 2004) these findings may have important implications for California policymakers. The results of this study indicate that being language isolated in underserved ZIP codes and Hispanic in California tends to make a household

have more demand for automobile insurance. Perhaps these language isolated households are still in underserved ZIP codes despite their greater demand because they have more trouble than English speaking households in understanding the details related to purchasing insurance. These details could involve not being able to communicate with anyone at an insurance company, not knowing which of the many insurance companies to choose from, and not understanding what types or amounts of insurance to purchase (Hunstad, 1999).

The goal of the California Department of Insurance in promulgating these regulations is to address the issue of availability and affordability of automobile insurance in underserved communities. The strongest most consistent results found in this study are most relevant for poverty stricken urban areas. The results suggest that both poverty and urbanization are factors that lead to a lower demand for automobile insurance. Perhaps the problem of low insurance demand in these areas could be partially remedied by outreach programs to better educate people about the importance of automobile insurance. These programs could also help the public find affordable insurance that would meet their needs. Vouchers or targeted subsidies could also be used to remedy the problem of low automobile insurance demand in some urban areas.

Another idea would be to expand the Assigned Risk program in California. As currently constituted the program only covers those who cannot obtain conventional automobile liability insurance. The usual reason that they find it hard to get insurance is because of poor driving records. Insurance companies are then assigned to write insurance for them usually at higher prices. It could be modified so that the insurance companies would not charge unwarranted higher prices. If this program were expanded to cover those in urban areas that find it hard to obtain insurance it could increase access to automobile insurance.

Another way to increase access to automobile insurance would be to increase the number of agents and service offices in underserved areas. Because automobile insurance is still a localized market, having a greater number of agents in underserved areas would likely increase demand in these areas. Potential customers in these areas would have agents that were familiar with their communities and better able to help them find insurance products that would fit their needs.

This research highlights some interesting results for Hispanics and language isolated families. Future research could be devoted to determining why Hispanics and language isolated families actually have greater

demand for automobile insurance. Perhaps by studying this surprising result new ideas could be found to help others increase their access to automobile insurance.

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