

NAMIC ISSUE ANALYSIS



MATCHING RATE TO RISK:

ANALYSIS OF THE AVAILABILITY AND AFFORDABILITY
OF PRIVATE PASSENGER AUTOMOBILE INSURANCE

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1. INTRODUCTION

Auto and home insurance play a critical role in the economy by providing a source of recovery for losses and financial security for households. Competition in auto and home insurance markets helps to ensure fair prices and broad availability of coverage. Further, insurance is closely regulated in the U.S. and this regulation provides additional safeguards for consumers. Reputable stakeholders in the business of insurance agree that the regulation of insurance should include vigorous protection of consumers as well as viable and efficient insurance markets. Indeed, competition and regulation should work hand in hand in serving the interests of consumers. However, neither competition nor regulation can guaranty that insurance will be inexpensive or widely available for all consumers. Premiums will necessarily be higher for consumers with greater risk and the supply of coverage will be constrained for people who strain or fail to meet the conditions for insurability.

Problems with the availability and cost of auto and home insurance in certain communities and allegations of industry “redlining” have received considerable political attention and generated many contentious policy debates since the 1950s.¹ Consumer groups allege that insurance companies engage in unfair discrimination in their pricing and underwriting activities for auto and home insurance that have disproportionately negative effects on certain groups of consumers or areas, e.g., low-income households, minorities, older urban neighborhoods, etc. Concerns about unfair discrimination are linked with issues regarding the availability and affordability of insurance. Consumers groups contend that minority and low-income consumers tend to have greater difficulty in obtaining insurance and/or pay more for it because of unfair discrimination.

Is there unfair discrimination by insurers that contributes to the availability and affordability problems of certain consumers? To address this question, we need to define what constitutes “unfair discrimination.” What constitutes unfair discrimination depends on the standard one uses to distinguish between what is fair and unfair. Insurance economists prefer to use an actuarial standard by which pricing and underwriting is only unfair if it is not commensurate with an insured’s risk. Others may use different standards of fairness that hold that insurance prices should be the same for all insureds or based on an insured’s ability to pay.



¹ The term “redlining” was coined in the 1960s to refer to the discriminatory practice of avoiding investment in or providing services to certain communities with high-risk or unfavorable demographics, typically with large minority populations. Over time, “redlining” has been used to label practices that treat certain geographic areas or groups of consumers unfairly.

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While some may believe that insurers intentionally and explicitly discriminate against protected groups, current concerns raised by consumer advocates now pertain primarily to what some would consider implicit unfair discrimination. More specifically, there is the view that certain factors used in pricing and underwriting (e.g., insurance or credit-based insurance scores) have disproportionately negative effects on certain groups and are not good measures of risk even if insurers do not intend to discriminate against these groups.² Additionally, some contend that these factors serve as proxies for race and ethnicity — this implies that insurers do intend to discriminate against certain groups in ways that are not explicit. Industry representatives have strongly responded to these allegations arguing that higher risk, not redlining, causes some consumers living in certain areas to pay higher premiums and possibly have to obtain coverage through residual market mechanisms or nonstandard insurers.³

Insurance economists have focused on whether there is evidence of unfair discrimination (either explicit or implicit) against minority, low-income, and urban households in auto and home insurance as reflected in market outcomes (e.g., loss ratios, the types of insurance purchased, etc.). Generally, they have not found such evidence in pricing, e.g., loss ratios in areas where there is a high proportion of minority and/or low-income households are similar to or even higher than loss ratios in other areas controlling for other variables. Economists cannot rule out the possibility that some consumers cannot always purchase the coverage they need or want, but conclude that this more likely due to their higher risk than unfair discrimination.

Others have weighed in on this debate including academics in disciplines other than insurance or economics (see, for example, Squires, 1997). State insurance departments have issued a number of studies on the subject of redlining and the availability and affordability of auto and home insurance. Most of the insurance department studies have concluded that the evidence does not support redlining allegations, although the availability and affordability of insurance for some consumers remains a concern.⁴

As state insurance regulators and legislators have wrestled with these issues, so has the National Association of Insurance Commissioners (NAIC). Over the years, various NAIC committees, task forces, etc. have investigated redlining allegations and availability and affordability concerns. During the 1990s, the NAIC issued a number of reports on these topics, culminating in a final report in 1998 (NAIC, 1998). Most recently, it has developed an extensive database on auto insurance at a zip code level and issued a study in March 2020 utilizing this database (NAIC, 2020). On July 23, 2020, the NAIC's Executive Committee announced the formation of a special committee on race and insurance.

The recent NAIC study focuses primarily on the availability and affordability of personal auto insurance in the various states. The primary empirical contribution of the associated report is charts, maps, and tables that present data and calculations using these data that pertain to the cost and availability of insurance for each state for the years 2013-2017. Importantly, the published report does not draw any conclusions regarding what its calculations indicate. It appears that the primary objective of the report is to show the data available to each state insurance department and demonstrate how it can use these data to examine auto insurance availability and affordability.

² Consumer groups also allege that fewer insurance agents (producers) relative to the number of consumers are located in high-minority areas and that minority policyholders are more likely to encounter problems in getting their claims paid.

³ Some homes may not qualify for a standard homeowners (HO3) policy because of their characteristics or location.

⁴ Insurance department reports that contend that there is evidence of redlining were primarily issued in the 1970s, 1980s, and 1990s. I have been unable to find a more recent insurance department report that contends that redlining occurs.

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The NAIC obtained zip code level insurance data from statistical agents that presumably reflect the experience of most if not all insurers writing auto insurance in the states. The elements included in this insurance data are premiums earned, losses incurred, earned exposures, and incurred claims. These data are delineated by coverage (e.g., Bodily Injury Liability, Collision, etc.).

The NAIC used these data elements to calculate average premiums, pure premiums, loss ratios, claim frequency, claim severity, and estimates of the percentage of uninsured motorists by zip code and combinations of zip codes. The NAIC combined the insurance data with data from the American Community Survey (ACS) on economic and demographic variables for each zip code for which these variables are available. Additionally, the NAIC supplemented these data with residual market data and certain state variables such as state required minimum liability coverage limits.

The primary objective of the NAIC study was to present certain summary statistics for each state and demonstrate the kinds of analyses that can be performed with the data it acquired which it has made available to the insurance department in each state. The report does not provide figures at a zip code level; it only provides figures for certain aggregations of zip codes such as Core-Based Statistical Areas (CBSAs) and zip codes aggregated by income quartiles. The study report does provide color-coded maps at a zip code level for certain metrics.

As insurance regulators and insurance companies have been asked to address allegations of unfair discrimination and develop solutions to availability and affordability concerns, there is interest in what the available data indicate with respect to these allegations and proposed solutions. In this context, the National Association of Mutual Insurance Companies (NAMIC) commissioned an analysis of certain data provided in the NAIC's most recent report. Specifically, my task is to analyze data on average premiums, pure premiums, and loss ratios delineated by income quartile for each state to determine how these metrics vary with income.

The results of my analysis are consistent with the findings of insurance economists and inconsistent with the allegations of consumer groups with respect to whether there is evidence of redlining. Note that consumer groups' allegations of unfair discrimination against minority consumers are linked to their allegations of unfair discrimination against low-income households. The link between income and race/ethnicity is economic and demographic; e.g., the mean and median income of minority households is lower than it is for non-minority households.⁵ If insurers overcharge low-income drivers (and by implication some minority drivers), then loss ratios should be lower for low-income drivers than they are for high-income drivers. My results indicate that the opposite is much more likely. Loss ratios tend to vary inversely with income, indicating that low-income drivers receive more benefits in relation to the premiums they pay than other drivers do. Additionally, my results suggest that low-income drivers tend to pay higher premiums, consistent with their claim costs that also tend to be higher.

However, these general patterns are not consistent across all states; in some states loss ratios vary directly with income and average premiums and average loss costs vary inversely with income. Because the data I was able to work with was aggregated by income quartile, I could not control for other factors that are associated with the variables of interest. Hence, it is necessary to perform a more rigorous multivariate analysis with more granular data to gain insight into the market conditions in any given state.

⁵ According to data published from the 2019 American Community Survey, the median income of Black or African American households was \$43,862 compared to \$55,658 for Hispanic or Latino households, \$69,823 for White households, and \$93,759 for Asian households. Obviously, not all minority persons (e.g., African Americans, Latinos, etc.) have low income and not all persons with low income are minorities. The point here is that certain minority groups such as African Americans will be disproportionately represented among low-income persons or household, e.g., the percentage of people in the lowest income quartile and who are also African American is higher than the percentage of persons in the highest income quartile and who are also African Americans.

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This report is organized as follows. In the next section, I discuss economic principles and institutions pertinent to my analysis and the broader topic of unfair discrimination in auto and home insurance. Section 3 offers a review of certain studies that are representative of the broader literature on redlining. In Section 4, I present my analysis of the income quartile data. Section 5 summarizes and concludes

2. PRINCIPLES AND INSTITUTIONS RELEVANT TO ALLEGATIONS OF UNFAIR DISCRIMINATION

It is helpful to establish a foundation for considering issues and arguments concerning redlining in auto and home insurance. In this section, I discuss the economic and insurance principles that should be considered in examining allegations of unfair discrimination in insurance, certain institutional aspects of insurance markets and regulation pertinent to this topic, and the implications of these principles and institutions for market efficiency and equity.

2.1. ECONOMIC AND INSURANCE PRINCIPLES

2.1.1. GENERAL ECONOMIC PRINCIPLES

In terms of economic principles, we would not expect there to be actuarially unfair discrimination in a “competitive” market. Perfect competition exists when a market satisfies four fundamental characteristics: 1) there are many small buyers and sellers; 2) the product is standardized; 3) there are no barriers to entry or exit; and 4) there is complete and perfect information (Martin, 1988). In the model of perfect competition, the market price is set a level that just covers producers’ costs (including their cost of capital or a fair profit) and producers operate at maximum efficiency.

Because auto insurers’ products and services are somewhat differentiated, the model of monopolistic competition (a form of imperfect competition) is more applicable to auto insurance markets than perfect competition. In the model of monopolistic competition, firms’ products are differentiated but similar (Scherer and Ross, 1990). Each firm faces a separate demand curve, with a high elasticity of demand; consumers will switch between firm’s products for relatively small differences in price. Further, there are many firms and entry and exit barriers are low. Hence, in a monopolistically competitive market, firms still compete as consumers may choose between firms’ products based on their prices as well as their attributes. In a monopolistically competitive market, there is strong price and product competition that maximizes consumer surplus and allows firms to earn no more than a normal profit or fair rate of return on net worth.

In the real world, no market satisfies the conditions for perfect competition. Hence, economists have developed the concept of workable competition as a basis for assessing the structure, conduct, and performance of real world markets (Scherer and Ross, 1990). A market is considered workably competitive when its characteristics come “close” to meeting the criteria for perfect competition and government intervention would not improve the market’s performance. The concept of workable competition is also applicable to monopolistically competitive markets.

In a workably competitive market, we would expect the prices paid by different consumers for a good or service to be commensurate with producers’ costs in providing the good or service. In other words, two consumers who purchase the same good should pay the same price for it. If it costs more to provide this good to Buyer A than Buyer B, then Buyer A should pay a higher price that reflects the difference in cost.

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Economists study price discrimination from the perspective of how firms may be able to earn “economic profits” (i.e., profits that would exceed a fair rate of return or the cost of capital) by charging different buyers different prices for the same good or service. Put simply, “price discrimination is the sale (or purchase) of different units of a good or service at price differentials not directly corresponding to differences in supply cost” (Scherer and Ross, 1990, p. 489). This definition includes not only the sale of identical products at varying prices, but also charging the same price in transactions entailing different costs. In a monopolistically competitive market that meets the standards for workable competition, we would expect differences in firms’ prices to reflect the costs of the differences in their products.

Three conditions must be met for sellers to engage in price discrimination. One, the seller must have some control over prices, i.e., some degree of market power. Economic price discrimination cannot occur in a perfectly competitive market and, arguably, not in a monopolistically competitive market that meets the conditions for workable competition. Two, the price discriminator must be able to segregate its customers into groups with different elasticities of demand, or into discrete classes with varying reservation prices (the highest prices buyers will pay for any specific unit of output). Three, opportunities for arbitrage — resale by low-price consumers to high-price consumers — must be constrained.

Economists have identified three primary classifications for types of price discrimination found in the real world. They are: 1) personal discrimination, based on differences among individual consumers; 2) group discrimination, in which intergroup differences are exploited; and 3) product discrimination, under which different products are priced discriminatorily. The classes of price discrimination potentially pertinent to insurance are personal discrimination and group discrimination. More specifically, one type of personal discrimination is charging wealthier customers more as their demand should be less elastic than that of less affluent customers. There are several types of group discrimination potentially relevant to insurance: 1) charging new customers less than established customers; 2) loyalty discounts; and 3) charging different groups (e.g., segregated by age, gender, etc.) different prices based on their reservation prices or demand elasticities.⁶

Becker (1993) suggests that testing for economic price discrimination should attempt to infer whether profits differ for products or services sold to minority and non-minority consumers. In other words, if firms are discriminating against minority consumers, then their profits should be higher for these consumers than for non-minority consumers.



⁶ A classic example of this type of discrimination is how airlines seek to separate business travelers (with less elastic demand) from vacation travelers (with more elastic demand) and charge them different fares.

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2.1.2. APPLICATION TO INSURANCE

To apply these economic principles to insurance, we need to consider how insurance is structured and priced. In property-casualty insurance, an insurance policy is essentially a contract in which an insurer promises to pay the insured certain amounts contingent on the insured's losses according to the contract's provisions. For liability coverages, an insurer may pay at least a portion of the damages caused by the insured to others. An insurer also may agree to pay certain expenses of an insured associated with a covered loss such as legal or transportation expenses.

Insurers must price the cost of the policies they sell based on actuarial analysis of the expected "loss cost" of a given policy for a given insured. The premium for a specific policy and insured must also cover the expected expenses of issuing and servicing the policy (including the cost of the insurer's duty to defend the insured in related litigation) as well as the insurer's cost of capital.

These principles are best illustrated through the following example. Consider the case of two vehicle owners - Susan and Jack - who purchase exactly the same auto insurance policy from the ABC Insurance Company. While the policies Susan and Jack buy are the same, we will assume that their risk of having claims differs. Susan is a very careful driver (e.g., she always drives within the speed limit) while Jack is a reckless driver (e.g., he often drives over the speed limit, runs stop signs, etc.). Hence, Jack would be expected to incur more losses and pay a higher premium than Susan. This would not constitute price discrimination as economists have defined it as long as the premiums paid by both drivers are commensurate with their relative risk of claims.

Now consider the same case with the modification that Susan's and Jack's driving behavior and risk of having claims are exactly the same. Under what conditions would ABC be motivated and able to engage in price discrimination between Susan and Jack? Let us also assume that a woman's demand for insurance is less elastic than it is for men. If Susan's elasticity of demand for auto insurance is less than that for Jack, ABC could try to charge Susan more for her coverage. ABC's incentive to do so would be the opportunity to earn an excess profit on Susan's policy. However, to engage in such a strategy, ABC would need to have market power, i.e., the market for auto insurance would not be workably competitive. Otherwise, other insurers would offer Susan a price commensurate with her risk and she would not buy a policy from ABC.

Hence, for actuarially unfair discrimination to occur, there would need to be some form of market failure that would enable insurers to acquire market power. Additionally, insurers would need to be able to segregate low-income or minority consumers and charge them higher premiums, all other things equal. The research indicates that auto insurance markets are highly competitive, which means that it would be difficult for one or more insurers to acquire market power. Auto insurance markets do suffer from information problems to some degree. Some consumers may have some difficulty in comparing prices and products from different insurers. Additionally, insurers can only estimate the expected cost of insuring a specific driver. However, the literature suggests that low-income consumers tend to have a greater elasticity of demand for auto insurance than high-income consumers do (see, for example, Sherden, 1984).⁷ Consequently, charging low-income consumers more should not result in supra-competitive profits.

⁷ Sheridan (1984) finds that the demand for auto bodily injury liability, collision and other than collision coverage is income inelastic, and the elasticity of demand decreases with income. Note that with mandatory coverages, demand for the minimum amount of coverage should be highly income inelastic. The demand for coverage above the minimum should be more elastic.

2.2. INSTITUTIONAL ASPECTS OF AUTO INSURANCE MARKETS AND REGULATION

Here it is helpful to review certain institutional aspects of auto insurance markets and their regulation that bear on the issue of unfair discrimination. Insurers have to deal with information problems in underwriting and pricing the policies they issue as they seek to be competitive and earn a fair rate of return on their capital. Additionally, insurers must comply with insurance regulations that govern their pricing and underwriting practices.

2.2.1 INSTITUTIONAL ASPECTS OF AUTO INSURANCE MARKETS

In underwriting and pricing their policies, insurers seek to obtain and employ as much information as reasonably possible. Their objective is to determine a cost-based premium for a specific policy and insured. Auto insurance policies, while far from uniform, are relatively similar across different insurers. Consumers do have choices with respect to the coverages they purchase and certain policy provisions that will affect the premiums they pay, all other things equal. Additionally, there are “quality” differences among insurers, beyond those reflected in their policies.⁸ Higher quality insurers would be expected to charge higher premiums, all other things equal.

In almost all states, drivers are required to purchase specified minimum amounts of liability coverage; these minimum limits vary somewhat among states. Drivers in some states are also required to purchase Uninsured Motorists/Underinsured Motorists (UM/UIM) coverage and/or Personal Injury Protection (PIP) coverage. For example, in Michigan, drivers are required to have \$50,000 in Bodily Injury Liability (BIL) coverage per person, \$100,000 in BIL coverage per accident (all persons), and \$10,000 in Property Damage Liability (PDL) coverage. Michigan drivers also are required to have \$250,000 in PIP coverage (Medicare and Medicaid enrollees can opt out of buying PIP coverage). A consumer can choose to buy higher liability limits than the minimum required and other coverages that are not required. We would expect low-income drivers to be less likely to purchase higher liability limits as they have less discretionary income and fewer assets to protect, all other things equal.

There are no state laws that require drivers to carry Collision or Other-Than-Collision (OTC) coverages on their vehicle(s). However, if a driver uses financing to purchase a new or used vehicle, or lease their vehicle, the lender or lessor may require her to carry Collision and OTC coverage. Consumers also choose their deductibles for these coverages, which can range from \$100 to \$2,000. Insurers charge higher premiums for lower deductibles. Generally, it does not make economic sense to carry physical damage coverage on older vehicles with low market values. In choosing physical damage coverages and their deductibles, we would expect consumers to balance the cost of the coverage with their ability to pay for uninsured losses out of pocket.

Insurers use historical data on claims and other information to develop their rating plans that they file with regulators. Using actuarial analysis, insurers develop rates that reflect their projected losses (claims payments) and expenses for the future period for which the rates will apply. Insurers’ projections are based on historical experience combined with consideration of factors (e.g., law changes, court rulings, etc.) that would affect their historical trends going forward.⁹ The rates that insurers file employ a “base rate” that is adjusted for different insured characteristics (e.g., location, years of driving experience, etc.) and policy provisions (e.g., liability limits, deductibles, etc.).

⁸ For example, consumers rate some insurers more highly than others for their assistance in filing and adjusting claims.

⁹ Large insurers typically rely on their own data in developing their rates. Small insurers tend to rely on advisory loss costs provided by advisory organizations (e.g., the Insurance Services Office) which they may modify based on their experience.

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Depending on what a state's regulations allow, insurers will use various rating factors to estimate the cost of insuring different insureds and the corresponding rates. These factors can include:

- Geographical location
- Gender
- Education
- Years of driving experience
- Claim history
- Previous insurance coverage
- Miles driven annually
- Age
- Marital status
- Occupation
- Driving record
- Insurance or credit score
- Vehicle type
- Vehicle use

Insurers also offer various premium discounts that can include:

- Affinity discount
- "Loyalty" discount¹⁰
- Driver training discount
- Green vehicle discount
- Multi-vehicle discount
- Anti-theft discount
- Good driver discount
- Good student discount
- Multi-policy discount¹¹



¹⁰ This discount reduces an insured's premium if they stay with the same insurer for several years or more. The discount reflects insurers' savings in acquisition costs for established customers and the value of the information they acquire on these customers.

¹¹ Typically, consumers will receive discounts when they purchase their auto and home insurance and other coverages from the same company. This discount reflects economies of scope associated with providing multiple policies to the same customer.

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These rating factors and discounts reflect insurers' estimates of cost differences among different insureds, and will affect what a driver will pay for a given policy. Further, a driver's premium will depend on whether they pay their premium in full or in monthly installments. Paying by month will increase the premiums a driver pays for a given policy, all other things equal. Paying in full reduces a driver's premiums as insurers effectively recognize the investment income they earn on premiums held in reserve over the course of a policy.

Insurers' rating plans vary with respect to how they weight different rating factors and the discounts they offer. Additionally, there can be differences in the provisions of their policies.¹² Further, insurers differ in other ways such as their distribution channels (e.g., independent agents, exclusive agents, direct response, etc.) and quality of service.¹³ All of these things can lead to differences among insurers in the premiums they would charge the same driver for a similar policy. This is why consumers are advised to shop for coverage to obtain price quotes from several companies to determine what would be the best deal for them.

Estimating the cost of insuring a specific driver with a given policy is not a perfect science. Insurers, necessarily, must employ rating factors that have a statistical association with insureds' expected claim costs (risk) and for which they can obtain reliable and verifiable information. The cost of acquiring such information and operationalizing its use are also considerations. Further, insurers will consider what is "socially acceptable" in choosing their rating factors and can only employ factors allowed by regulators.

Competition compels insurers to use rating factors that are as accurate as reasonably possible.¹⁴ There are several reasons why insurers employ rating factors that accurately measure the risk of an insured. Importantly, accurate rating factors help to ensure that the premiums a driver pays will be sufficient to cover the expected costs of covering them. Insurers' pricing also seeks to minimize the problems of adverse selection and moral hazard. Adverse selection is "the tendency of persons with a higher-than-average chance of loss to seek insurance at standard (average) rates which, if not controlled by underwriting, results in higher-than-expected loss levels." (Redja and McNamara, 2016; p. 28). Moral hazard, as defined by economists, is the tendency for persons with insurance to either intentionally cause a loss or take less care in avoiding or preventing losses.

If an insurer fails to employ accurate rating factors it will be subject to greater adverse selection and possibly greater moral hazard. Adverse selection can occur when an insurer overcharges low-risk insureds and/or undercharges high-risk insureds. Low-risk drivers will be inclined to buy less coverage if they are overcharged and high-risk drivers will buy more coverage if they are undercharged; either scenario will reduce an insurer's profits and possibly cause it to lose money on the policies it issues. Further, an insurer that overcharges low-risk drivers will risk losing these drivers as customers to other insurers with more accurate rating systems. Insurers' failure to use accurate rating factors could also subject them to greater moral hazard, as their insureds' will have diminished incentives to control their risk and avoid having claims.¹⁵ Moral hazard also will increase insurers' losses and reduce their profits.

Insurance economists generally believe that auto insurance markets are highly competitive based on their structural and performance characteristics (Cummins and Weiss, 1991). To support this point, Table 1 shows Herfindahl-Hirschman indices (HHIs) and estimated net rates of return for state personal auto insurance markets. The HHI is the sum of squared market

¹² For example, some insurers' policies will cover the cost of original equipment manufacturer (OEM) parts while others will only cover the cost of after-market parts.

¹³ Quality of service refers to things such as how well a company assists its policyholders in resolving billing issues and adjusting and paying claims, its brand name recognition, and its financial strength, among others.

¹⁴ There are certain factors that insurers might wish to use but the high cost of obtaining the information needed for such factors make them infeasible.

¹⁵ If an insurer did not use rating factors for an insured's driving record and prior claims (or underweighted these factors), its insureds would have less incentive to drive safely.

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shares of all firms in a market and is a commonly used measure of structural competition.¹⁶ As can be seen in this table, the HHI in 2019 ranged from 740 to 1,038 in the various states with a mean value of 1,079 and a median value of 1,038. According to the Department of Justice (DOJ) and Federal Trade Commission (FTC) merger guidelines, markets with HHIs less than 1,500 are considered to be “unconcentrated”; markets with HHIs between 1,500 and 2,500 are considered to be “moderately concentrated.”¹⁷ Only four states had HHIs that exceeded 1,500.¹⁸

Table 1
State Market Concentration & Profitability*
Personal Auto Insurance

State	HHI	RONW(%)	State	HHI	RONW(%)
Alabama	1,139	4.3	Nebraska	979	4.9
Alaska	1,790	10.7	Nevada	955	2.9
Arizona	917	6.0	New Hampshire	836	9.8
Arkansas	1,055	5.4	New Jersey	1,158	5.1
California	765	4.6	New Mexico	1,074	6.4
Colorado	912	-1.0	New York	1,588	3.1
Connecticut	813	6.0	North Carolina	880	5.1
Delaware	1,298	5.1	North Dakota	842	10.6
DC	1,983	9.2	Ohio	894	8.5
Florida	1,440	2.8	Oklahoma	1,032	5.6
Georgia	1,045	0.9	Oregon	1,011	7.7
Hawaii	1,493	15.1	Pennsylvania	980	6.0
Idaho	848	9.7	Rhode Island	1,163	4.3
Illinois	1,239	3.2	South Carolina	1,114	2.2
Indiana	873	7.3	South Dakota	828	1.6
Iowa	1,019	7.7	Tennessee	1,015	4.8
Kansas	882	4.2	Texas	888	3.6
Kentucky	1,108	-0.4	Utah	740	5.6
Louisiana	1,502	-8.2	Vermont	868	10.2
Maine	754	10.3	Virginia	1,089	6.7
Maryland	1,313	4.9	Washington	889	6.1
Massachusetts	1,047	5.3	West Virginia	1,272	10.2
Michigan	1,098	-2.8	Wisconsin	1,038	4.5
Minnesota	1,149	7.4	Wyoming	1,272	6.5
Mississippi	1,089	4.6	Countrywide	794	4.1
Missouri	967	5.6	Mean	1,134	5.0
Montana	1,052	6.4	Median	1,055	5.3

*HHI figures are for 2019; RONW figures are for 2018.

Source: NAIC, S&P Global, and author's calculations

¹⁶ Higher HHI values indicate higher market concentration.

¹⁷ Department of Justice, “Horizontal Merger Guidelines” accessed November 27, 2020 at <http://www.justice.gov/atr/horizontal-merger-guidelines-08192010>. Generally, mergers in unconcentrated markets do not raise competitive issues; mergers in moderately concentrated markets could raise competitive issues that warrant further analysis.

¹⁸ The HHI was 1,502 in Louisiana, 1,588 in New York, 1,790 in Alaska, and 1,983 in the District of Columbia.

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With respect to profitability, states' estimated 10-year average rate of return on net worth (RONW) in 2018 ranged from -8.2% to 15.1% with a mean value of 5.4% and a median value of 5.4% (NAIC, 2019).¹⁹ Only six states had RONWs greater than 10% and only one state (Hawaii) had a RONW greater than 11%. These statistics indicate auto insurers are not earning excess profits, i.e., a rate of return greater than their cost of capital.

While insurance economists question whether insurers would have the incentives and ability to unfairly discriminate against minority or low-income consumers, consumer advocates contend that certain insurer practices, such as their rating factors, do result in such discrimination. For example, consumer groups argue that insurers use of credit scores in underwriting and pricing, have disparately negative effects on minority and low-income consumers.²⁰ Dane (2006) argues that insurers' use of zip codes to construct their rating territories for home insurance enables them to discriminate against neighborhoods with large concentrations of minorities. Prince and Schwarz (2020) contend that the use of artificial intelligence can lead to "proxy discrimination" against certain groups of insurance consumers.

In summary, insurers have strong motives to price risk accurately and not engage in unfair discrimination. Insurers would only be motivated to engage in unfair discrimination if it would increase their profits or they clung to irrational and erroneous biases regarding the risk of certain groups of drivers. For insurers to profit from unfair discrimination against certain drivers, such drivers would have to have a lower elasticity of demand for insurance than other drivers do. Clinging to irrational and erroneous biases would hurt an insurer financially and reputationally and undermine its business objectives.

2.2.2. REGULATION

Every state has laws and regulations that govern insurers' underwriting and pricing practices, including the rating factors they are allowed to use. States' laws set the standards that insurers' rates must meet. Some states prohibit or limit the use of certain rating factors; in all states, insurers are not allowed to use race or ethnicity as rating factors. For personal auto insurance, insurers are required to file their rates with regulators either before or when their rates become effective in all states except Wyoming. Insurers are also subject to market conduct examinations in which regulators can review insurers' marketing, underwriting, rates and rating plans, and claims handling.

Generally, state laws require that insurers' rates shall not be "excessive, inadequate, or unfairly discriminatory."²¹ How regulators interpret and apply these standards can vary among states. The Actuarial Standards Board's (ASB) "Actuarial Standards of Practice for Ratemaking" (ASOPs 12, 13, 35, 29, and 53) provides guidance to property/casualty actuaries regarding the principles that should be followed in ratemaking. These principles could be summarized as follows:

1. A rate is an estimate of the expected value of future costs.
2. A rate provides for all costs associated with the transfer of risk.
3. A rate provides for the costs associated with an individual risk transfer.
4. A rate is reasonable and not excessive, inadequate or unfairly discriminatory if it is an actuarially sound estimate of the expected value of all future costs associated with an individual risk transfer.

¹⁹ The rate of return on net worth (RONW) is a commonly used measure of profitability as it indicates a firm's profits in relation to the amount of capital that it holds. A higher RONW indicates higher profitability.

²⁰ There is a considerable literature on the use of credit scores in underwriting and pricing auto and home insurance. Brobeck et al. (2013) articulates the views of consumers groups that insurers' use of credit scores results in unfair discrimination against low-income consumers. On the other side, Kellison et al. (2003) and Golden and Brockett (2007) conclude that credit scores are a good predictor of drivers' auto insurance claims, among other factors.

²¹ The NAIC's Property and Casualty Model Rating Law (File and Use Version) articulates these standards (NAIC, 2010). All 50 states and the District of Columbia have laws that specifically state that rates should not be excessive, inadequate, or unfairly discriminatory.

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The NAIC's Product Filing Review Handbook ("Handbook") elaborates on regulatory standards for rates, including the requirement that rates not be "unfairly discriminatory" (NAIC, 2016). With respect to this standard, it states:

"Unfairly discriminatory" is a concept often based on "cost based pricing," with the key word being "unfairly." For example, charging different prices to a man vs. a woman is discriminatory; however, it is only unfairly discriminatory if it cannot be reasonably explained by differences in expected costs. With that said, there are sometimes restrictions on what criteria are allowed by law. A few states have enacted constraints on rating criteria such as the use of gender or marital status in private passenger automobile rating

The Handbook also offers guidance on how regulators should review rate classification for unfair discrimination. It states:

The use of classifications and similar rating variables allows for the price of insurance to be more equitable amongst policyholders, because policyholders pay a price commensurate with the risk they bring to the insurance company. Regulators do need to evaluate classifications for unfair discrimination. A rule of thumb is that prices are not unfairly discriminatory when consumers are charged different amounts that are actuarially justified (or justified based on risk/cost).

Additionally, the Handbook recognizes how proper rate classification promotes the availability of coverage. It states:

In addition, rate classifications help to maintain availability in the market for all risks. If one rate would be charged to every policyholder, then some groups of policyholders with identifiable characteristics would create large profits to insurance companies, and others would result in large losses. As these groups are identified, the insurance companies would start to write the more profitable business and would not write the others, resulting in availability problems for those high-risk groups.

It is helpful here to elaborate a bit more on the rate filing process. When insurers wish to change their rates for an existing product or file rates for a new product, they must file these rate changes or rates with regulators except in Wyoming as noted above. States employ different systems for the review and approval of rates. These systems are: prior approval (PA), file and use (FU), flex rating (FR), and use and file (UF). Under a PA system, insurers are required to file their rates and have them approved before they can be implemented. In FU states, insurers are required to file their rates before they are implemented, but regulatory approval is not required; regulators may subsequently disapprove rates that have been filed. In FR states, rate changes that fall within certain bands (e.g., not more than a 7% increase) are not subject to prior approval. Under a UF system, insurers must file their rates within a specified period after they have been implemented.²²



²² Typically, in FU and UF states, regulators can subject rates to prior approval if they determine that there is a lack of competition in a market.

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In all of these systems, insurers must file their rates with supporting analysis and documentation. This includes analysis and documentation supporting the rating factors they use and the rate differentials for different rate classifications. Even in FU and UF states, regulators can review insurers' rating plans and disapprove them if they determine that they fail to meet governing regulatory standards, including the requirement that rates not be unfairly discriminatory.

The regulators in a specific state can exercise considerable discretion in how they interpret and enforce their regulatory standards. Discussions with regulators and insurers, as well as empirical studies, indicate that regulators in some states attempt to impose constraints on insurers' overall rate levels and/or rate differentials while regulators in other states tend to rely on the market to set rates without interference (see, for example, Born et al., 2018).²³ For example, regulators in State A may seek to cap rate differentials between low and high-risk areas, while regulators in State B do not attempt to cap territorial rate differentials. State legislators can also affect regulation through the enactment of laws, such as prohibitions of certain rating factors.

A number of factors can influence how rates are regulated in a specific state (Born et al., 2018). These factors include, but are not limited to regulators' ideologies and perceptions, market conditions, the political environment, and the salience of regulatory issues among consumers. The regulators in a state may not trust market forces and competition to keep rates fair and not excessive and, hence, may believe that is necessary for them to impose rate constraints. Political pressure also may cause regulators to cap rates. Consequently, whether motivated by ideology or political pressure, regulators may seek to limit the rate differentials between groups of insureds in ways that are inconsistent with economic, insurance, and actuarial principles.

The issue of unfair discrimination in insurance has recently attracted the attention of the U.S. Congress. In 2019, two bills were introduced in the House that would arbitrarily constrain the use of certain factors by insurers for underwriting and pricing auto insurance. H.R. 3693 would prohibit the use of a large set of "income-related" variables to determine rates or the eligibility for coverage, e.g., income, education, occupation, gender, marital status, etc.²⁴ H.R. 1756 would effectively prevent the use of credit score information in pricing and underwriting auto insurance by disallowing consumer reporting agencies from providing consumer information to be used for these purposes.²⁵

2.3. IMPLICATIONS FOR MARKET EFFICIENCY AND EQUITY

As discussed in the NAIC Handbook cited above, arbitrary regulatory restrictions on rating factors and/or the rate differentials between low and high-risk insureds can cause market distortions. Generally, regulatory attempts to impose cross-subsidies between different groups of drivers will be unsuccessful or undermine market efficiency and equity. In a market where the purchase of insurance is somewhat voluntary and insurers have some discretion in who they cover, low-risk drivers can avoid subsidizing high-risk drivers, at least to some degree.

Arguably, the purchase of auto insurance in most states is at least partially voluntary. While most states require drivers to have certain insurance coverages, such as minimum amounts of liability coverage, drivers still can make choices with respect to non-mandatory coverages and liability limits above a state's minimum limits. Further, regardless of state insurance requirements, some drivers may choose to not buy any insurance. If low-risk drivers believe they will be overcharged for the

²³ This is the case among PA states as well as FU states. Regulators in some FU states effectively administer their systems as "de facto prior approval" (Born et al., 2018).

²⁴ The text of H.R. 3693 is available at <https://www.congress.gov/bill/116th-congress/house-bill/3693/text?q=%7B%22search%22%3A%5B%22prohibit+auto+insurance+discrimination+act%22%5D%7D&r=1&s=2>.

²⁵ The text of H.R. 1756 is available at <https://www.congress.gov/bill/116th-congress/house-bill/1756/text?q=%7B%22search%22%3A%5B%22prohibit+auto+insurance+discrimination+act%22%5D%7D&r=2&s=3>.

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insurance they would buy, they will be inclined to buy lower amounts of coverage or go without insurance altogether. This will effectively increase the costs of and premiums for drivers who purchase coverage or buy larger amounts of coverage.²⁶ This creates several problems including suboptimal amounts of coverage for certain drivers, larger numbers of uninsured or underinsured drivers, and actuarially unfair and inequitable rates for low-risk drivers who buy insurance.

Arbitrary regulatory restrictions on rating factors and/or rate differentials can cause other market distortions (Bartlett et al., 1999). If an insurer believes such restrictions will significantly lower its profitability and possibly harm its financial condition, it may elect to leave an auto insurance market. Alternatively, if faced with such restrictions, an insurer may seek to avoid offering coverage to drivers for whom they are not allowed to charge adequate rates. All other things equal, this will decrease the availability of insurance for high-risk drivers and force them into the residual market. Further, such restrictions can increase moral hazard as high-risk drivers will have diminished incentives to lower their risk (Derrig and Tennyson, 2011).

Additionally, if certain rating factors are banned or restricted, insurers will necessarily be compelled to place greater weight on the factors they are allowed to use. In this respect, we would expect that greater weight would be placed on allowed factors that are correlated with disallowed factors. This would be expected, as insurers will seek to preserve risk-based pricing as much as possible with the factors they are still allowed to use. Consequently, attempts by regulators to constrain rating factors they believe are unfair or because of political pressure, will lead to inequities in insurers' pricing to the extent that the factors they are allowed to use will not reflect risk as accurately as the factors they would prefer to use.²⁷

3. REVIEW OF SELECTED STUDIES AND REPORTS

In this section, I summarize and critique selected studies, reports, and other publications that address the topic of unfair discrimination or redlining in personal auto and home insurance. My intent is not to provide a thorough literature review but rather to review the most important studies, etc. that are representative of the broader literature. My review includes publications on auto insurance and home insurance, as many of the same issues arise in both lines. I begin with publications issued by various organizations that contend that insurers engage in unfair discrimination in property-casualty insurance, followed by a review of reports of the NAIC and the Missouri Department of Insurance (MDOI). I then discuss academic studies on redlining.

3.1. PUBLICATIONS CONTENDING UNFAIR DISCRIMINATION IN INSURANCE

There have been numerous reports and other publications issued by consumer advocates, state insurance departments, and other organizations contending that insurance companies engage in unfair discriminations, i.e., redlining, against low-income, minority, and urban consumers in personal auto and home insurance. These studies employ various approaches in analyzing what constitutes redlining and how it is manifested in different aspects of insurers' practices and consumers' experiences, such as pricing, underwriting (availability), and claims handling, among others. These studies have focused primarily on homeowners insurance and to a lesser extent on auto insurance. Here I discuss several of these studies that are representative of the broader

²⁶ The more drivers who go uninsured or underinsured, the higher will be the cost of UM/UIM coverage for drivers who buy insurance. Drivers who do not buy UM/UIM coverage may not be fully compensated for damages caused by drivers who are uninsured or underinsured.

²⁷ For example, assume that regulators in a given state ban the use of credit scores in rating even though the research indicates that credit scores are a good indicator of risk. In such a scenario, insurers will be compelled to place greater weight on the other factors they are allowed to use, such as gender or marital status. Also, assume for the sake of discussion, that gender is correlated with credit scores – female drivers tend to have higher credit scores than male drivers. All other things equal, the effect of this will be that male drivers with high credit scores will pay higher rates than they should and female drivers with low credit scores will pay lower rates than they should.

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literature in this category, with a primary emphasis on the underwriting and pricing of personal auto insurance.

One such report was issued by the Center for Economic Justice (CEJ) in 1997 (CEJ, 1997a). This report summarizes analysis the CEJ performed regarding the placement of urban drivers with non-standard companies (typically county mutual companies) or the Texas Auto Insurance Plan (TAIP) in Texas.²⁸ According to the report, the CEJ's analysis was performed with zip code level data. It states that it performed a regression analysis that showed that "even holding income constant, consumers in zip codes with high minority populations (at least 80%) were two to three times more likely to be insured with non-standard insurers or the TAIP than consumers in low (no more than 10%) minority communities." The report does not include tables presenting the results of the CEJ analysis.

Several of the key findings of the CEJ report are summarized here. One, it concluded that drivers in poor and minority communities were disproportionately rejected by standard companies and forced into the higher cost nonstandard market and assigned risk plan. Two, it argued that drivers pay considerably more when they obtain their coverage from nonstandard insurers or the TAIP. The premiums for minimum liability coverage in the TAIP were double what they were for the same policy purchased from a preferred or standard company. Premiums for nonstandard writers ranged from 2-4 times the benchmark rates set for standard and preferred companies.

Three, the report contended that the rates paid by drivers insured by county mutuals are not related to their risk. It observed that the rate-regulated companies pay out 73 cents in claims for every premium dollar while county mutuals pay out 63 cents in claims for every premium dollar. Further, it observed that while minority drivers are disproportionately placed into high-risk markets, they are no more likely than non-minority drivers to have been involved in traffic accidents or have at-fault accidents or driving violations. Four, the report states that the high rates paid by drivers insured by county mutuals or in the TAIP, drives up the number of uninsured motorists who cannot afford these rates.

There are several concerns with this report. One, it only summarizes its analysis and does not provide tables showing its results nor does it explain its methodology in any detail. Two, it does not appear that its analysis controlled for the claims costs of the drivers that it contends are unfairly treated or any other factors that could affect the cost and availability of insurance for minority and low-income groups. Three, it seems to assume that the lower loss ratios of county mutuals indicates that they are overcharging their insureds; it does not consider other reasons for this disparity in loss ratios. Hence, due to lack of rigor and other issues with the CEJ analysis and report, their findings are questionable.

A 2015 study by the Consumer Federation of America (CFA) warrants brief mention here (Feltner and Heller, 2015). In this study, the authors compared the premiums charged by five national insurers across zip codes categorized by minority population, income, and population density using a large national dataset. They found that the insurers charged substantially higher premiums to consumers living in high-minority zip codes than consumers living in low-minority zip codes; the magnitude of this disparity increased with the percentage of minorities in a zip code. They also found that this disparity held in areas with similar median household incomes and population densities. Additionally, the authors compared average premiums in communities with metropolitan areas distinguished by their percentage of minority residents. In this comparison, they also found that premiums were higher in communities with a high percentage of minorities.

²⁸ In Texas, a number of county mutuals are used as nonstandard auto insurers as they are allowed to charge higher rates than other insurers. This is a unique feature of the Texas market due to how it is regulated. This is different from the typical focus and business of a county mutual company, e.g., serving individuals, farmers, and small business owners in rural areas.

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This study has a major flaw in that it did not control for differences in claims costs or risk across zip codes. The authors suggest that income and population density control for differences in claim costs to some degree but these variables are poor substitutes for claim costs. Hence, this study does little if anything to inform policymakers on whether insurers engage in unfair discrimination against minority consumers. Indeed, studies such as this one can do more harm than good in making unsupported allegations.

A third and more recent study on redlining in auto insurance that received considerable attention was issued by ProPublica and Consumers Reports (ProPublica, 2017). ProPublica used Quadrant Information Services to obtain premium quotes for BIL and PDL insurance from a number of insurance companies for a hypothetical driver (a 30-year old woman with a “safe” driving record) and policy for various zip codes in four states - California, Illinois, Missouri, and Texas. It further classified zip codes into categories based on their percentages of non-white residents.²⁹ It then compared these premium quotes with calculated pure premiums for BI and PD liability for these same zip codes using data on incurred or paid losses and insured car-years obtained from the insurance departments in the four states.

In all four states, ProPublica found that many insurers’ had “significant gaps” between the premiums they charged in minority and non-minority zip codes, which it concluded had the “same average risk.” More specifically, in Illinois, its analysis indicated that of the 34 companies it analyzed, 33 of them were charging premiums at least 10% higher for the same driver in minority zip codes than in “comparably risky” non-minority zip codes. In Missouri and Texas, it found that at least one-half of the insurers (21 of 25 insurers in Missouri, 9 of 18 insurers in Texas) charged higher premiums for the same driver in high-risk minority zip codes than in non-minority zip codes with “comparable risk.” In California, eight of the 21 insurers it analyzed had premiums at least 10% higher in minority areas than in non-minority areas with “similar risk.”

While the ProPublica study is more rigorous than the CFA study discussed above, it still has a significant flaw and raises other methodological issues. Importantly, it compares a specific company’s premiums in a zip code with its calculation of the “average” pure premium in that zip code based on data submitted by all or most insurers. Hence, it does not compare an insurer’s premiums with its own loss costs between two zip codes. Further, it does not consider factors other than claim costs that could affect the full costs of providing coverage and the associated premiums in different areas. Finally, there is the issue that some insurers may target certain types of drivers (not based on race or ethnicity) with better rates as a matter of competition and marketing; this could affect ProPublica’s results. In sum, this study falls considerably short in proving its contention that insurers unfairly discriminate against minority consumers in their pricing of auto insurance. This said, it raises issues that would benefit from a more thorough and methodologically sound analysis.

Putting aside their methodological flaws, these studies fail to address some important questions regarding insurers’ incentives, market conditions, and regulation. One, what would be insurers’ incentives to overcharge certain groups of consumers? Two, insurers should not be able to engage in economic price discrimination in a workably competitive market. Indeed, as discussed in the previous section, auto insurance markets are structurally competitive and insurers’ profits in these markets are not excessive. Three, why would regulators allow insurers to charge unfair prices?

²⁹ For California and Texas, a zip code was defined as minority if 66% or more of its population was non-white. For Illinois and Missouri, a zip code was defined as minority if 50% or more of its population was non-white.

3.2. GOVERNMENT REPORTS

In this section, I discuss studies conducted by the NAIC in the 1990s and a recent report issued by the Missouri Department of Insurance. I conducted a search for reports or studies issued by state insurance department or other government agencies on the topic of redlining and was not able to find any that has been issued since the early 1990s.

3.2.1. NAIC STUDIES IN THE 1990S

The NAIC has conducted several studies of the availability and affordability of auto and home insurance. Here I will discuss the analyses that it conducted in the 1990s.³⁰ The results of these analyses were summarized in a final report issued by the Insurance Availability and Affordability Task Force in 1998 (NAIC, 1998).

It is helpful here to provide some context for the NAIC's activities in this area. Following the 1992 Los Angeles riots, the California Department of Insurance conducted a survey that suggested that a significant portion of homeowners and businesses had inadequate insurance, had purchased coverage from shaky offshore surplus lines companies, or had difficulty in collecting on claims. This prompted the California Insurance Commissioner - John Garamendi - to ask the NAIC to create a subgroup (which was subsequently elevated to a task force) to study and make recommendations regarding insurers' underwriting and market practices, and suggest solutions to insurance availability and affordability problems. It was clear at that time that allegations that insurers were engaging in unfair discrimination against minority, low-income, and urban consumers were motivating this initiative. Over the next several years, NAIC staff, under task force direction, conducted analyses of the issues of concern to the task force. The task force also solicited input from various groups, including consumer groups and industry trade associations.

The task force issued a special call for zip code level data for major metropolitan areas, in 23 states, for the 40 largest insurer groups. These data included premiums, exposures, insurer-initiated cancellations and non-renewals, policies in force, and agents appointed for several property-casualty lines including personal auto liability, homeowners, and dwelling fire. Unfortunately, claims data were not included in the call due to industry resistance and the task force's acquiescence to this resistance.³¹ This compromised the analyses that could be performed with these data, as we had no real way to measure directly the risk of claims otherwise.³² These data were supplemented by Census data on the economic and demographic characteristics of zip codes. Additionally, the statistical agents provided data on homeowners insurance premiums, FAIR plan penetration, and loss costs in urban areas by rating territory; because these data were aggregated by territory, they could not be linked to Census data on economic and demographic variables.

Several reports and working papers were prepared under the direction of the task force. Of these reports and working papers, three are most relevant to the topic of this paper: A Preliminary Analysis of Urban Insurance Markets (1994), the Impact of Loss Costs on Urban Homeowners Insurance Markets (1995), and a Preliminary Analysis of Urban Auto Insurance Markets (1996). It is useful to begin with a discussion of the two homeowners insurance reports, as they informed our analysis of auto insurance. Additionally, the allegations of unfair discrimination in homeowners insurance are similar to those for auto insurance, although the underlying conditions affecting the availability and cost of insurance differ between the two lines.

³⁰ As the NAIC's Director of Research, I supervised these analyses from 1992-1996.

³¹ I strongly urged the inclusion of claims data in the call, but was not successful in this effort.

³² We could employ proxies for claim risk such as population density or the average age of homes but these variables fall short of actual data on claims.

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The research underlying the 1994 report included multiple regression analysis (employing zip code level data) of the relationships between several dependent variables reflecting the availability and cost (e.g., average premiums) of homeowners insurance with a number of explanatory variables including the concentration of minority residents in a zip code (Klein, 1994). The results of this analysis suggested that the availability of coverage was negatively associated with several variables related to the risk of claims (we did not have actual claims data for this analysis as noted above) as well as the percentage of minorities. The results for the average premium regressions suggested that several economic variables were associated with higher premiums, as well as the percentage of minority residents. In my summary of the results of our analysis, I stated that while the relationship between availability and the cost of insurance with minority concentration was concerning, the fact that we did not have good controls for the risk of claims prevented us from drawing any firm conclusions regarding unfair discrimination. In other words, we could not rule out the possibility that availability was diminished and premiums were higher in minority areas due to the higher risk of claims in these areas.

In the 1995 study, we were able to combine zip code level data on variables reflecting the availability and cost of homeowners insurance with territory level data on loss costs (Klein, 1995).³³ Our results indicated that territory loss costs did not have a statistically significant effect on the FAIR plan market share in a zip code but we did find that the FAIR plan market share was positively associated with minority concentration. The average premium in a zip code was positively associated with territory loss costs as well as minority concentration. While these results were concerning, I expressed my reservations regarding our results given that we did not have loss cost data at a zip code level.

In the 1996 study, we conducted a multiple regression analysis of possible factors affecting the premiums for and availability of auto liability insurance (Klein, 1996a).³⁴ As with our earlier studies, we employed zip code level data on auto insurance (obtained through the special call) supplemented by Census economic and demographic data as well as territory level data on loss costs. These data comprised approximately 1,300 zip codes in 63 cities in 20 states. We did not have claims or loss data by zip code. We were confined to using territory level data on claims and loss ratios, supplemented by zip code data on variables hypothesized to affect claim costs, e.g., such as vehicle density, income, etc.

Our results indicated a positive association between the average liability premium in a zip code and its associated territorial loss cost (pure premium). We also found a positive association between average liability premiums and minority concentration. Both the territory pure premium and the territory loss ratio were positively associated with the residual market share and negatively associated with the proportion of insured vehicles in a zip code. Minority concentration also was positively associated with the residual market share and negatively associated with the proportion of insured vehicles. As in the two previous reports, I urged caution in drawing conclusions from our results that insurers had engaged in unfair discrimination, as we did not have loss data at a zip code level.

In July of 1996, I submitted a working paper on urban homeowners insurance markets in Missouri to the task force (Klein, 1996b). As Missouri collects zip code level data on auto and homeowners insurance, I was able to employ these data in a regression analysis that included loss data at a zip code level. In my analysis, I found that the association between minority concentration and insurance availability and premiums was not statistically significant.³⁵ The 1998 task force report indicates

³³ These territories were the standard territories promulgated by insurance statistical agents, not the territories that insurers necessarily use. A given territory can encompass a large number of zip codes and territory boundaries can cross zip code boundaries.

³⁴ We combined premiums for BI and PD liability and PIP coverage (where applicable) to construct a combined liability average premium.

³⁵ My results in this study paralleled those in subsequent studies I conducted for Texas, Pennsylvania, and Maryland.

that it considered my working paper. However, the task force chose not to include the results of my analysis in its report.

The following excerpt from the task force report reflects its conclusions based on the research performed under its direction:

The personal lines data collected and its subsequent analysis showed that consumers in low-income, high-minority urban neighborhoods in contrast to those in high-income, low-minority urban markets or suburbs: 1) pay more for insurance in relation to coverage provided; 2) often purchase policies with less coverage; and 3) are more likely to be insured in residual market programs. However, in analyzing this data, researchers were unable to draw definitive conclusions about the causes of these market conditions and the data could not prove conclusively that unfair discrimination exists.

3.2.2. MISSOURI DEPARTMENT OF INSURANCE STUDY

In 2018, the Missouri Department of Insurance issued what could be considered the most rigorous study of personal auto insurance conducted by a state insurance department (Missouri Department of Insurance, 2018). This report addresses various aspects of the state's auto insurance market; I will focus my review here on its discussion of those aspects most closely related to allegations of unfair discrimination or redlining.

Using zip code level data, the MDOI study employed statistical analysis, including regression analysis, to estimate the associations between various market outcome metrics (e.g., claim frequency, loss ratios, etc.) as dependent variables with other factors (e.g., minority concentration, income, etc.) as explanatory variables.

The report offers several key findings regarding unfair discrimination issues (taken verbatim from the report):

- As may be expected, insurance costs are highest in core urban areas, decline in the periphery of urban areas, and are lowest in rural areas.
- The cost of liability coverage tended to be lower in low income areas overall, but significantly higher in core urban areas with higher concentrations of minorities.
- Territory rating factors have a small but statistically significant inverse relationship to median household income, and a strongly positive relationship to minority concentration.
- Territories appear to be actuarially justified. To the extent there was any pattern detected across territories, it appears that higher territory rating factors are associated with higher loss ratios, indicating that they are not overcharged relative to risk compared to lower territory factors.
- Statistical analysis strongly suggests that any actuarial method based solely on geographic risk will produce rating territories that significantly segregate along racial/ethnic lines.
- In the past, agent location has been used by the DIFP to measure the level of available services in an area. High minority areas have less than half the agents per capita as elsewhere in the state.

In sum, the MDOI study does not support allegations that insurers engage in unfair price discrimination. It does raise questions with respect to certain other market metrics such as high complaint ratios and fewer agents in high minority areas that would benefit from further investigation.

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3.2.3. PENNSYLVANIA DEPARTMENT OF INSURANCE STUDY

In 2016, the Pennsylvania Department of Insurance issued a summary of its findings from its study of personal auto premiums and losses employing ZIP code data (PADOI, 2016). The stated purpose of the study was to “determine whether personal auto insurance premiums were commensurate with insured loss experience in ZIP codes with: 1) large minority populations; 2) low household incomes; and 3) low percentages of college graduates.”

The findings of study are as follows.

1. The combined loss ratio for the 28 ZIP codes in Pennsylvania in which African Americans are a majority of the population was 66.9%, which is higher than the study’s statewide loss ratio of 64.0%.
2. In the 25 ZIP codes in Pennsylvania with the highest percentages of Hispanic residents, the combined loss ratio was 66.9%, which is higher than statewide loss ratio of 64.0%.
3. In the 25 ZIP codes in Pennsylvania with the lowest median household income, the combined loss ratio was 67.8%, which is higher than statewide loss ratio of 64.0%.
4. In the 25 ZIP codes in Pennsylvania with the lowest percentage of 4-year college graduates, the combined loss ratio was 67.4%, which is higher than statewide loss ratio of 64.0%.

Hence, the findings of this study are consistent with other studies that have found that loss ratios in high-minority or low-income ZIP codes are not lower (and may be higher) than they are in low-minority and high-income ZIP codes.

3.3. ACADEMIC STUDIES

There have been a number of academic publications on “redlining” in home and auto insurance, but very few of these studies have employed econometric methods to assess the evidence on whether insurers engage in unfair discrimination. Here I will review three studies that best reflect the research on this topic.

3.3.1. HARRINGTON AND NIEHAUS (1998)

Harrington and Niehaus (1998) could be considered the seminal academic study of redlining in auto insurance. Their analysis employed zip code level data for Missouri for the years 1988-1992 for three types of auto insurance coverage: liability (BI and PD combined), collision, and other-than-collision. The insurance variables included in these data were exposures, number of claims, losses paid, and premiums written for five insurer types (e.g., standard, non-standard, etc.) and five exposure classes based on car value ranges or liability limits. These insurance data were supplemented with other economic/demographic data for variables such as the percentage of minority residents, population density, age distribution, marital status, employment, income, and education.

Harrington and Niehaus used weighted least squares regression to estimate the association between several dependent variables that measured the cost and availability of coverage and a set of explanatory and control variables. These dependent variables include loss ratios, average claim costs, and the market share of non-standard companies. They hypothesized that if insurers unfairly discriminate against minority drivers, then the loss ratios for these drivers should be lower than they are for

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non-minority drivers.³⁶ Lacking data on minority drivers versus non-minority drivers, the percentage of minority residents in a zip code served as a proxy variable to reflect the proportion of minority drivers in the insurance data.

Their regression results did not indicate that loss ratios are positively associated with the percentage of minorities in a zip, i.e., they did not find evidence that minority drivers are charged higher premiums in relation to their loss costs than non-minority drivers are. The coefficients for the minority concentration variable were negative but not statistically significant for OTC and liability coverages. The coefficient for minority concentration was negative and statistically significant for collision coverage. They speculated that this result was not due to “reverse discrimination” but might be explained by random variation in claim costs and variation in the demand for quality that was not captured by their control variables.

Their analysis also indicated that minority concentration was positively associated with average claim costs, i.e., claim costs are higher in high-minority zip codes. They suggested that this association was due to variables omitted from their model that are correlated with claim costs and minority concentration. Finally, their regressions indicated a positive association between the non-standard market share and minority concentration. They concluded that they could not distinguish whether this relationship was due to discrimination or omitted costs factors, but that the latter was more likely based on their loss ratio and average claim cost results. Harrington and Niehaus cautioned that while their statistical analysis did not reveal evidence of redlining, they could not test or control for unfair discrimination through quality differences that would be reflected in the profits for different groups of consumers but not loss ratios.³⁷



3.3.2. ONG AND STOLL (2007)

Ong and Stoll (2007) warrants some discussion as they contend that their analysis indicates that risk as well as redlining account for why drivers in minority (Black and Latino) neighborhoods pay significantly more for auto insurance than drivers in non-minority neighborhoods. Their analysis employed zip code level data for Los Angeles, CA. These data included: 1) liability premium quotes for several insurers for a hypothetical driver and policy; 2) claim frequency and average loss costs (pure premiums) obtained from the California Department of Insurance; 3) vehicle accident and crime rates; and 4) economic/demographic variables (the percentage of the population that is Black, Latino, and under the poverty line).

³⁶ This hypothesis draws from Becker (1993) as discussed in Section 2.

³⁷ Using complaint data for Missouri, Chan (1998) found that the quality of auto insurance provided to consumers in high-minority zip codes was lower than the quality provided to consumers in other zip codes. Chan (1999) reached similar findings for homeowners insurance.

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They used ordinary least squares regression to estimate the association between average premiums (presumably a simple average of the premium quotes they obtained) with their explanatory variables reflecting risk, poverty, and demographics. Their results indicated positive associations between average premiums and their risk variables as well the percentage of Black and “poor” residents. They found a negative relationship between the average premium and the percentage of Latino residents. Based on additional analysis they concluded that drivers in high poverty, Latino neighborhoods are subject to unfair discrimination. Hence, they concluded that both risk and redlining cause minority drivers to pay more for auto insurance than non-minority drivers.

While Ong’s and Stoll’s results are interesting, their analysis suffers from the same methodological problems that afflict the ProPublica study. Importantly, their analysis links average premiums based on the quotes from several insurers with insurance loss data for all insurers writing business in a zip code. Additionally, they do not control for quality differences among insurers as well as other cost factors that could affect premiums. Further, they do not explain why they included claim frequency with the average claim cost or vehicle crime rate (which presumably would affect OTC premiums but not liability premiums). Hence, while their analysis raises questions similar to those raised by the ProPublica study, it falls far short of making a case that insurers engage in redlining.

3.3.3 GRACE AND KLEIN (2001)

Grace and Klein (2001) focused on homeowners insurance, but their study also warrants some discussion as it is the most rigorous study published on redlining in homeowners insurance and addresses the same allegations made for auto insurance.³⁸ Their analysis employed zip code level data for Texas for the years 1993-1997 for homeowners and dwelling fire insurance. These data were confined to three Texas MSAs - Dallas-Ft. Worth, Houston, and San Antonio - as these areas comprised both urban neighborhoods and adjoining suburbs. The insurance variables included in these data were the number of policies, premiums written, exposures, paid losses, and the number of claims. These insurance data were supplemented with other economic, demographic, and housing data for variables such as the percentage of minority residents (Black and non-Black Hispanic), income, the median value of homes, and the percentage of vacant homes.

They used weighted least squares regression to estimate the association between several dependent variables that measured the cost and availability of coverage and a set of explanatory and control variables. These dependent variables include average claim costs, loss ratios, and the percentage of dwelling fire policies. Their objective was to determine if the percentage of minorities in a zip code is associated with any of these dependent variables, controlling for other factors related to risk, economic conditions, demographic characteristics, and housing characteristics.

Based on their regression results, Grace and Klein did not find evidence that average claim costs for homeowners insurance are positively or negatively associated with the percentage of minorities in a zip code, controlling for other factors. The coefficients for the minority concentration variable were positive but not statistically significant. In other words, their analysis indicated that claim costs were neither higher nor lower in high minority neighborhoods. While they found some evidence that homeowners loss ratios were positively associated with minority concentration (when county effects were included), the overall effect of minority concentration was not statistically significant. Stated in another way, loss ratios were neither higher nor lower in high minority areas.

³⁸ Using state-level data, Regan (2007) found that the share of dwelling fire policies in a state was positively associated with the percentage of minority homeowners in the state. However, this relationship was not statistically significant when variables controlling for risk-related and economic factors were included in her analysis.

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Finally, their regression results with respect to the association between minority concentration and the percentage of dwelling fire policies are of some interest. Using one specification of their model, they found a positive association between these variables. Using a second specification of their model, they found the opposite. Grace and Klein discussed the limitations of this aspect of their analysis, including their inability to separate the effects of supply and demand conditions. Hence, they could not draw any conclusions with respect to the association between minority concentration and the availability of insurance.

Taken together, Grace and Klein concluded that they did not find evidence that the racial or ethnic composition of a neighborhood plays any measurable role in determining how much homeowners pay for insurance nor the kind of insurance they purchase. Rather, they opined that factors associated with the risk of loss and the demand for insurance appear to primarily drive the terms of insurance transactions. These findings tend to support the soundness of industry risk classifications and are consistent with the contention that economic conditions and not irrational bias (or economic price discrimination) determine the supply of insurance to areas where minorities are concentrated.

Their analysis, however, is subject to some of the same limitations that pertain to Harrington and Niehaus (1998). As is the case for any of these studies, they could not test directly for discrimination against minority homeowners; the percentage of minority residents in a zip code served as a proxy for the percentage of minority-owned homes reflected in the insurance data. Further, they could not control for quality differences among homeowners policies sold by different insurers.

4. ANALYSIS OF INCOME QUARTILE DATA

4.1. INTRODUCTION AND BACKGROUND

In this section of my report, I review and analyze auto insurance average premiums, pure premiums, and loss ratios by income quartile in the various states. This analysis is relevant in assessing allegations by some groups and organizations (e.g., consumer advocates) that insurers' underwriting and pricing practices unfairly discriminate (explicitly or implicitly) against certain groups of consumers such as low-income households, minorities, and drivers living in certain urban areas. Data provided in the NAIC's report enables us to examine certain insurance metrics by income quartile in each state to determine if there is any evidence of unfair discrimination as reflected by what different groups of insureds (delineated by income) pay

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for insurance in relation to what they receive in return in the form of claims payments in each state.³⁹ This examination alone cannot support or refute the allegations of unfair discrimination but can provide some additional perspective in the context of the broader literature on this topic.

It is helpful here to briefly summarize the information available from the NAIC report for this analysis. Using zip code level data submitted by insurers through statistical agents, the NAIC calculated average premiums, pure premiums, and loss ratios for each zip code.⁴⁰ The NAIC “aggregated” these zip code calculations by income quartile; the bounds of each quartile are state specific.⁴¹ The NAIC used data from the 2013-2017 American Community Survey (ACS) 5-Year estimates to determine the median income for each zip code, which was then used to construct the income quartiles to which each zip code was assigned.⁴² The NAIC’s calculations were presented in graphs that also include value labels that I was able to use to construct the tables for this report.

It is important to note that the calculated metrics aggregate all auto insurance coverages for the years 2013-2017. Hence, I was not able to calculate these metrics by the type of coverage or by year. This necessarily qualifies the results of my analysis, as I could not control for variation in the distribution of coverages or coverage provisions (e.g., liability limits, deductibles, etc.) across income quartiles. The NAIC report does provide information on claim frequency and severity for each of the liability coverages as well as the number of exposures for each coverage that I was able to use to calculate pure premiums for Bodily Injury Liability (BIL) and Property Damage Liability (PDL).

4.2. ANALYSIS

4.2.1. AVERAGE PREMIUMS

As consumers groups contend that low-income drivers pay too much for auto insurance, I begin my analysis by examining average premiums by income quartile. The average premium is equal to earned premiums divided by earned exposures (car-years). Table 2 shows the results of my calculations.⁴³ More specifically, this table shows the average premium for each income quartile as well as for the “no income available” category for each state.⁴⁴ Additionally, I divided the average premium in the lowest (1st) income quartile by the average premiums in each of the other income quartiles for the purpose of comparison. For example, if this ratio is 110% for the 2nd quartile, this indicates the average premium in the 1st quartile is 10% higher than it is in the 2nd quartile. I refer to this ratio as the “income quartile ratio” (IQR).

³⁹ No data are available in the NAIC report for Massachusetts.

⁴⁰ The NAIC report provides details on how a combined average premium was calculated for each zip code. First, it calculated average premiums for the liability coverages, collision coverage, and other-than-collision (OTC) coverage. The coverages chosen for the liability average premium were the liability coverage types required or coverages, where at a state level, the earned exposures were at least 60% of the Bodily Injury Liability (BIL) earned exposures reported for that state. In calculating an average premium for all coverages combined, a coverage was deemed “elected by the average consumer” if the earned exposures for that coverage was at least 60% of the BIL earned exposures in a zip code. For example, if the exposures for collision and OTC coverages were at least 60% of the BIL exposures in a zip code, then the NAIC added the average premiums for all three coverages to calculate a combined average premium for that zip code. The NAIC report does not say whether the same approach was used to calculate the combined pure premium for a zip code. It also does not specify how it calculated a combined loss ratio for each zip code. It is possible that it used aggregated losses and premiums for all exposures to perform this calculation. Alternatively, it could have divided the calculated combined pure premium by the calculated combined average premium for each zip code to calculate its combined loss ratio. The calculated loss ratio will differ depending on which approach is used.

⁴¹ The NAIC report does not explain how it aggregated average premiums, pure premiums, and loss ratios for each income quartile. The reported metric for an income quartile could be based on a simple average for the variable, or a weighted average for the variable using the exposures for a specific coverage (e.g., BIL) to weight the variable for each zip code, or some other method.

⁴² Income data were not available for some zip codes. These zip codes were assigned to a “no income available” category. This category also includes insurance data for which a garaging zip code was not provided.

⁴³ As the NAIC figures reflect both voluntary and residual market data, my calculations in this table and the following tables also reflect voluntary and residual market experience.

⁴⁴ Zip codes placed in this category are ones for which the ACS did not provide income data because there was insufficient data to yield reliable statistics. Insurance data that did not have a garaging zip code were also placed in this category.

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Table 2 reveals that average premiums tend to be higher in the lowest quartile than in the other quartiles. While the average premium varies significantly across states, the mean value is \$509 for the lowest quartile, compared to \$475 for the 2nd quartile, \$476 for the 3rd quartile, and \$485 for the 4th quartile.⁴⁵ The median average premium is \$428 for the lowest quartile, compared to \$404 for the 2nd quartile, \$417 for the 3rd quartile, and \$423 for the 4th quartile.

Correspondingly, the mean value for the IQR is 106.3% for the 2nd quartile, 105.9% for the 3rd quartile, and 103.7% for the highest quartile. The median value of the IQR is 104.2% for the 2nd quartile, 102.9% for the 3rd quartile, and 98.5% for the highest quartile.

These statistics indicate that average premiums vary inversely with income. However, this is not the case in all states. The average premium in the lowest quartile is higher than it is in the 2nd quartile in 35 states, higher than it is in the 3rd quartile in 30 states, and higher than it is in the highest quartile in 21 states.

There could be several reasons for why the average premium is lower in low-income zip codes than in higher-income zip codes in a given state. One reason could be that in some states, low-income drivers purchase lower liability limits than other drivers and/or are less likely to purchase physical damage coverages.⁴⁶ It also is possible that low-income drivers tend to choose higher deductibles on their physical damage coverages but the opposite also may be the case.⁴⁷ Additionally, regulators may impose rating constraints that result in lower premiums for low-income drivers, all other things equal. Regardless, the fact that average premiums are highest in low-income zip codes in the majority of states, leads us to consider how claim costs vary with income.

I should note that the approach used by the NAIC to calculate an average premium for each zip code and income quartile could affect the average premiums reported for each quartile in a given state. Different rules for this calculation could result in different reported figures. This same caveat applies to the pure premium and loss ratio reported for each income quartile in a state.

Further, the exclusion of certain zip codes and insurance data from the income quartiles could create a bias that affects my results for all of the metrics analyzed in this report. For average premiums, my results could be biased if the zip codes and data excluded are not evenly distributed with respect to income and the associated insured vehicles tend to have higher or lower premiums. For example, if the excluded observations in a given state tend to be in low-income zip codes and these observations also tend to have higher average premiums, this could cause my calculations of the average premium for the lowest quartile to be less than it actually is. If there is a bias due to the excluded observations, the direction and magnitude of the bias could vary among states.

4.2.2. PURE PREMIUM

The pure premium — incurred losses divided by earned exposures — is a commonly used measure of claim costs. According to the NAIC, its data for incurred losses included allocated and unallocated loss adjustment expenses. My calculations for this metric are provided in Table 3. As in Table 2, I show the pure premium for each income quartile as well as for the “no income available” category for each state. Additionally, as in Table 1, I divided the pure premium in the lowest (1st) income quartile by the pure premiums in each of the other income quartiles to construct IQRs.

⁴⁵ The mean values in this table and the following tables are simple averages and are not weighted by exposures and any other volume measure.

⁴⁶ Low-income drivers may tend to purchase lower liability limits than other drivers because they have less discretionary income and also have less wealth to protect. Low-income drivers may be less likely to purchase physical damage coverage because they are more likely to have older vehicles; as the market value of a vehicle declines, at some point buying physical damage coverage does not make economic sense.

⁴⁷ A consumer can save money by purchasing higher deductibles, all other things equal. However, some low-income consumers may be concerned that they would not have sufficient resources to cover higher deductibles out of pocket.

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Table 2
Average Premium by Income Quartile

State	Income Quartiles					1st Quartile ÷ :		
	No Income	1st	2nd	3rd	4th	2nd	3rd	4th
Alabama	\$377	\$393	\$374	\$383	\$406	105.1%	102.6%	96.8%
Alaska	\$521	\$455	\$518	\$517	\$520	87.8%	88.0%	87.5%
Arizona	\$377	\$415	\$403	\$430	\$433	103.0%	96.5%	95.8%
Arkansas	\$332	\$345	\$344	\$359	\$374	100.3%	96.1%	92.2%
California	\$458	\$449	\$452	\$465	\$477	99.3%	96.6%	94.1%
Colorado	\$545	\$583	\$606	\$610	\$607	96.2%	95.6%	96.0%
Connecticut	\$1,712	\$1,863	\$1,578	\$1,533	\$1,580	118.1%	121.5%	117.9%
Delaware	\$696	\$750	\$720	\$636	\$713	104.2%	117.9%	105.2%
DC	\$609	\$740	\$575	\$525	\$475	128.7%	141.0%	155.8%
Florida	\$372	\$523	\$466	\$423	\$390	112.2%	123.6%	134.1%
Georgia	\$515	\$525	\$533	\$568	\$576	98.5%	92.4%	91.1%
Hawaii	\$472	\$419	\$429	\$405	\$421	97.7%	103.5%	99.5%
Idaho	\$283	\$301	\$325	\$316	\$318	92.6%	95.3%	94.7%
Illinois	\$440	\$415	\$390	\$410	\$419	106.4%	101.2%	99.0%
Indiana	\$356	\$353	\$310	\$320	\$338	113.9%	110.3%	104.4%
Iowa	\$276	\$270	\$258	\$256	\$268	104.7%	105.5%	100.7%
Kansas	\$335	\$376	\$345	\$341	\$367	109.0%	110.3%	102.5%
Kentucky	\$584	\$577	\$488	\$509	\$519	118.2%	113.4%	111.2%
Louisiana	\$776	\$821	\$852	\$833	\$881	96.4%	98.6%	93.2%
Maine	\$360	\$310	\$328	\$323	\$330	94.5%	96.0%	93.9%
Maryland	\$627	\$676	\$655	\$578	\$532	103.2%	117.0%	127.1%
Michigan	\$884	\$807	\$686	\$667	\$645	117.6%	121.0%	125.1%
Minnesota	\$444	\$436	\$405	\$428	\$454	107.7%	101.9%	96.0%
Mississippi	\$310	\$352	\$330	\$342	\$375	106.7%	102.9%	93.9%
Missouri	\$381	\$402	\$370	\$384	\$408	108.6%	104.7%	98.5%
Montana	\$372	\$362	\$375	\$382	\$383	96.5%	94.8%	94.5%
Nebraska	\$321	\$361	\$324	\$276	\$357	111.4%	130.8%	101.1%
Nevada	\$656	\$746	\$724	\$722	\$654	103.0%	103.3%	114.1%
New Hampshire	\$308	\$308	\$314	\$311	\$327	98.1%	99.0%	94.2%
New Jersey	\$860	\$1,051	\$874	\$822	\$767	120.3%	127.9%	137.0%
New Mexico	\$499	\$451	\$476	\$498	\$517	94.7%	90.6%	87.2%
New York	\$946	\$787	\$648	\$765	\$800	121.5%	102.90%	98.4%
North Carolina	\$357	\$342	\$336	\$359	\$385	101.8%	95.3%	88.8%
North Dakota	\$307	\$289	\$256	\$274	\$285	112.9%	105.5%	101.4%
Ohio	\$291	\$377	\$324	\$318	\$325	116.4%	118.6%	116.0%
Oklahoma	\$347	\$365	\$359	\$368	\$390	101.7%	99.2%	93.6%
Oregon	\$530	\$556	\$589	\$601	\$650	94.4%	92.5%	85.5%
Pennsylvania	\$405	\$477	\$385	\$379	\$420	123.9%	125.9%	113.6%
Rhode Island	\$599	\$769	\$577	\$547	\$515	133.3%	140.6%	149.3%
South Carolina	\$431	\$524	\$503	\$485	\$486	104.2%	108.0%	107.8%
South Dakota	\$259	\$265	\$235	\$279	\$265	112.8%	95.0%	100.0%
Tennessee	\$388	\$409	\$358	\$388	\$425	114.2%	105.4%	96.2%
Texas	\$569	\$577	\$555	\$562	\$589	104.0%	102.7%	98.0%
Utah	\$465	\$464	\$473	\$484	\$474	98.1%	95.9%	97.9%
Vermont	\$350	\$324	\$312	\$312	\$315	103.8%	103.8%	102.9%
Virginia	\$388	\$395	\$386	\$399	\$414	102.3%	99.0%	95.4%
Washington	\$609	\$578	\$609	\$638	\$664	94.9%	906.0%	87.0%
West Virginia	\$432	\$481	\$451	\$457	\$436	106.7%	105.3%	110.3%
Wisconsin	\$282	\$319	\$277	\$281	\$294	115.2%	113.5%	1085.0%
Wyoming	\$253	\$296	\$307	\$308	\$302	96.4%	96.1%	98.0%
Mean	\$485	\$509	\$475	\$476	\$485	106.3%	105.9%	103.7%
Median	\$418	\$428	\$404	\$417	\$423	104.2%	102.9%	98.5%
# States > 100%						35	30	21
# States ≤ 100%						15	20	29

Source: NAIC and author's calculations

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Table 3 reveals that pure premiums tend to be higher in the lowest quartile than in the other quartiles. As is the case for the average premium, the pure premium varies significantly across states. The mean value of the pure premium is \$390 for the lowest quartile, compared to \$349 for the 2nd quartile, \$351 for the 3rd quartile, and \$356 for the highest quartile. The median pure premium is \$309 for the lowest quartile, compared to \$283 for the 2nd quartile, \$306 for the 3rd quartile, and \$319 for the highest quartile.

Correspondingly, the mean value of the IQR is 110.1% for the 2nd quartile, 109.1% for the 3rd quartile, and 108.0% for the highest quartile. The median value of the IQR is 108.9% for the 2nd quartile, 105.4% for the 3rd quartile, and 100.0% for the highest quartile. I note here that the mean and median values of these ratios are consistently higher for pure premiums than they are for average premiums.

These statistics indicate that pure premiums vary inversely with income and this relationship is stronger for pure premiums than it is for average premiums. Hence, this leads to the observation that higher claim costs in low-income zip codes are likely an important factor in causing average premiums to be higher in low-income zip codes. However, as with average premiums, this is not the case in all states. The pure premium in the lowest quartile is higher than it is in the 2nd quartile in 37 states, higher than it is in the 3rd quartile in 32 states, and higher than it is in the highest quartile in 24 states.

A number of factors could account for higher pure premiums in low-income zip codes in a given state. It is possible but unlikely that drivers' choice of coverages, policy limits, deductibles, and other policy provisions cause pure premiums to be higher in low-income zip codes. All other things equal, I expect that low-income drivers tend to buy less rather than more coverage than higher-income drivers, deductibles excepted. If this is true, these statistics indicate that the claim frequency and/or claim severity tend to be considerably higher in low-income zip codes, despite presumably lower amounts of coverage purchased in these zip codes.



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Table 3
Pure Premium by Income Quartile

State	Income Quartiles					1st Quartile ÷ :		
	No Income	1st	2nd	3rd	4th	2nd	3rd	4th
Alabama	\$269	\$311	\$286	\$306	\$331	108.7%	101.6%	94.0%
Alaska	\$342	\$254	\$303	\$330	\$297	83.8%	77.0%	85.5%
Arizona	\$313	\$315	\$321	\$358	\$362	98.1%	88.0%	87.0%
Arkansas	\$280	\$242	\$233	\$256	\$271	103.9%	94.5%	89.3%
California	\$349	\$343	\$336	\$337	\$341	102.1%	101.8%	100.6%
Colorado	\$475	\$413	\$430	\$436	\$429	96.0%	94.7%	96.3%
Connecticut	\$1,409	\$1,466	\$1,234	\$1,206	\$1,272	118.8%	121.6%	115.3%
Delaware	\$493	\$634	\$572	\$480	\$554	110.8%	132.1%	114.4%
DC	\$554	\$730	\$453	\$371	\$278	161.1%	196.8%	262.6%
Florida	\$335	\$418	\$378	\$337	\$300	110.6%	124.0%	139.3%
Georgia	\$1,249	\$406	\$430	\$489	\$483	94.4%	83.0%	84.1%
Hawaii	\$258	\$264	\$282	\$255	\$264	93.6%	103.5%	100.0%
Idaho	\$202	\$208	\$231	\$229	\$236	90.0%	90.8%	88.1%
Illinois	\$513	\$307	\$282	\$309	\$327	108.9%	99.4%	93.9%
Indiana	\$255	\$263	\$228	\$241	\$263	115.4%	109.1%	100.0%
Iowa	\$187	\$190	\$186	\$180	\$198	102.2%	105.6%	96.0%
Kansas	\$250	\$278	\$243	\$261	\$276	114.4%	106.5%	100.7%
Kentucky	\$414	\$457	\$340	\$373	\$375	134.4%	122.5%	121.9%
Louisiana	\$580	\$688	\$663	\$674	\$721	103.8%	102.1%	95.4%
Maine	\$242	\$213	\$234	\$236	\$244	91.0%	90.3%	87.3%
Maryland	\$433	\$576	\$529	\$441	\$392	108.9%	130.6%	146.9%
Michigan	\$1,269	\$716	\$554	\$477	\$437	129.2%	150.1%	163.8%
Minnesota	\$298	\$324	\$279	\$295	\$310	116.1%	109.8%	104.5%
Mississippi	\$253	\$283	\$253	\$285	\$322	111.9%	99.3%	87.9%
Missouri	\$331	\$329	\$273	\$290	\$308	120.5%	113.4%	106.8%
Montana	\$243	\$216	\$213	\$233	\$236	101.4%	92.7%	91.5%
Nebraska	\$248	\$264	\$222	\$186	\$268	118.9%	141.9%	98.5%
Nevada	\$507	\$587	\$558	\$558	\$466	105.2%	105.2%	126.0%
New Hampshire	\$242	\$242	\$234	\$233	\$260	103.4%	103.9%	93.1%
New Jersey	\$880	\$843	\$628	\$564	\$487	134.2%	149.5%	173.1%
New Mexico	\$300	\$238	\$280	\$333	\$321	85.0%	71.5%	74.1%
New York	\$844	\$674	\$494	\$607	\$599	136.4%	111.0%	112.5%
North Carolina	\$289	\$274	\$250	\$270	\$273	109.6%	101.5%	100.4%
North Dakota	\$204	\$188	\$169	\$189	\$192	111.2%	99.5%	97.9%
Ohio	\$227	\$290	\$239	\$240	\$254	121.3%	120.8%	114.2%
Oklahoma	\$239	\$253	\$253	\$269	\$294	100.0%	94.1%	86.1%
Oregon	\$365	\$374	\$430	\$425	\$479	87.0%	88.0%	78.1%
Pennsylvania	\$351	\$384	\$294	\$290	\$328	130.6%	1324.0%	117.1%
Rhode Island	\$1,030	\$700	\$483	\$433	\$404	144.9%	161.7%	173.3%
South Carolina	\$222	\$413	\$387	\$365	\$365	106.7%	113.2%	113.2%
South Dakota	\$238	\$180	\$144	\$194	\$190	125.0%	92.8%	94.7%
Tennessee	\$239	\$307	\$245	\$288	\$318	125.3%	106.6%	96.5%
Texas	\$487	\$489	\$445	\$455	\$482	109.9%	107.5%	101.5%
Utah	\$337	\$327	\$359	\$354	\$333	91.1%	92.4%	98.2%
Vermont	\$168	\$212	\$200	\$197	\$204	106.0%	107.6%	103.9%
Virginia	\$271	\$284	\$284	\$305	\$319	100.0%	93.1%	89.0%
Washington	\$501	\$368	\$410	\$445	\$459	89.8%	82.7%	80.2%
West Virginia	\$254	\$290	\$255	\$264	\$260	113.7%	109.8%	111.5%
Wisconsin	\$219	\$254	\$211	\$213	\$235	120.4%	119.2%	108.1%
Wyoming	\$165	\$210	\$207	\$197	\$198	101.4%	106.6%	106.1%
Mean	\$412	\$390	\$349	\$351	\$356	110.1%	109.1%	108.0%
Median	\$299	\$309	\$283	\$306	\$319	108.9%	105.4%	100.0%
# States > 100%						37	32	24
# States ≤ 100%						13	18	26

Source: NAIC and author's calculations

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Table 4
Loss Ratio by Income Quartile

State	Income Quartiles					1st Quartile Minus :		
	No Income	1st	2nd	3rd	4th	2nd	3rd	4th
Alabama	71.8%	79.5%	77.5%	80.8%	82.4%	20.0%	-1.3%	-29.0%
Alaska	66.4%	57.0%	59.4%	64.7%	57.6%	-2.4%	-7.7%	-0.6%
Arizona	83.1%	76.0%	79.7%	83.4%	83.8%	-3.7%	-7.4%	-7.8%
Arkansas	84.7%	70.6%	68.0%	71.6%	72.1%	2.6%	-1.0%	-1.5%
California	76.4%	75.5%	74.1%	72.6%	71.8%	1.4%	2.9%	3.7%
Colorado	89.5%	74.4%	74.8%	75.8%	76.3%	-0.4%	-1.4%	-1.9%
Connecticut	75.2%	78.7%	70.1%	70.7%	72.2%	8.6%	8.0%	6.5%
Delaware	70.9%	84.5%	79.5%	75.4%	77.8%	5.0%	9.1%	6.7%
DC	91.7%	100.4%	75.5%	67.3%	54.8%	24.9%	33.1%	45.6%
Florida	90.0%	79.8%	81.0%	79.7%	77.1%	-1.2%	0.1%	2.7%
Georgia	244.8%	77.9%	81.4%	86.9%	84.5%	-3.5%	-9.0%	-6.6%
Hawaii	56.1%	59.2%	61.9%	58.8%	58.5%	-2.7%	0.4%	0.7%
Idaho	71.4%	67.1%	69.3%	70.9%	72.2%	-2.2%	-3.8%	-5.1%
Illinois	116.5%	73.8%	71.9%	74.8%	77.1%	1.9%	-1.0%	-3.3%
Indiana	71.5%	74.1%	72.8%	74.4%	76.3%	1.3%	0.0%	-22.0%
Iowa	67.6%	68.5%	70.3%	68.1%	71.8%	-1.8%	0.4%	-3.3%
Kansas	74.8%	74.1%	70.7%	76.6%	75.5%	3.4%	-2.5%	-1.4%
Kentucky	74.8%	79.2%	69.8%	73.2%	72.0%	94.0%	6.0%	7.2%
Louisiana	77.6%	86.5%	81.0%	83.8%	84.6%	5.5%	2.7%	1.9%
Maine	67.3%	68.8%	71.3%	73.2%	74.0%	-2.5%	-4.4%	-5.2%
Maryland	69.4%	85.4%	80.9%	76.6%	73.9%	4.5%	8.8%	11.5%
Michigan	143.6%	88.4%	80.3%	71.0%	67.5%	8.1%	17.4%	20.9%
Minnesota	67.0%	72.9%	67.3%	67.6%	66.6%	56.0%	5.3%	6.3%
Mississippi	81.6%	80.4%	76.6%	83.2%	85.9%	3.8%	-2.8%	-5.5%
Missouri	86.0%	82.1%	73.6%	75.1%	74.8%	8.5%	7.0%	7.3%
Montana	66.5%	61.5%	58.6%	63.0%	63.6%	2.9%	-1.5%	-2.1%
Nebraska	76.1%	72.6%	67.8%	66.5%	74.2%	48.0%	6.1%	-1.6%
Nevada	81.5%	81.6%	79.3%	788.0%	72.8%	2.3%	2.8%	88.0%
New Hampshire	78.4%	78.4%	74.6%	74.8%	79.4%	3.8%	3.6%	-1.0%
New Jersey	105.0%	80.3%	71.8%	68.5%	63.4%	8.5%	11.8%	16.9%
New Mexico	62.2%	56.0%	61.3%	69.3%	64.4%	63.0%	-13.3%	-8.4%
New York	89.8%	86.0%	76.3%	79.3%	74.5%	97.0%	6.7%	11.5%
North Carolina	83.8%	82.9%	78.0%	79.2%	76.0%	4.9%	3.7%	6.9%
North Dakota	66.4%	64.2%	64.5%	67.7%	66.2%	0.3%	35.0%	-2.0%
Ohio	78.2%	76.9%	73.7%	75.4%	78.0%	32.0%	1.5%	-1.1%
Oklahoma	69.0%	69.3%	70.5%	73.2%	75.4%	-1.2%	-3.9%	-6.1%
Oregon	68.9%	67.5%	73.3%	71.0%	73.9%	-5.8%	-3.5%	-6.4%
Pennsylvania	86.4%	80.6%	76.3%	76.7%	78.1%	4.3%	3.9%	2.5%
Rhode Island	172.1%	91.0%	83.7%	79.2%	78.4%	7.3%	11.8%	12.6%
South Carolina	50.9%	76.6%	74.4%	72.1%	71.3%	2.2%	4.5%	5.3%
South Dakota	90.2%	67.4%	60.2%	68.3%	70.6%	7.2%	-0.9%	-3.2%
Tennessee	61.8%	75.3%	68.8%	74.9%	75.3%	6.5%	0.4%	0.0%
Texas	85.8%	84.3%	80.2%	81.8%	82.2%	4.1%	3.0%	2.1%
Utah	72.5%	68.6%	73.7%	71.2%	68.0%	-5.1%	-26.0%	0.6%
Vermont	48.1%	65.6%	64.4%	63.3%	64.8%	1.2%	2.3%	0.8%
Virginia	69.7%	71.9%	73.6%	76.4%	71.1%	-1.7%	-4.5%	0.8%
Washington	83.7%	65.9%	69.3%	71.2%	70.4%	-3.4%	-5.3%	-4.5%
West Virginia	58.9%	59.0%	54.8%	55.7%	57.2%	4.2%	3.3%	1.8%
Wisconsin	77.8%	79.6%	76.0%	75.6%	79.8%	36.0%	4.0%	2.0%
Wyoming	65.3%	70.8%	67.4%	64.1%	65.6%	3.4%	6.7%	5.2%
Mean	82.4%	75.0%	72.2%	73.1%	72.7%	2.7%	1.9%	23.0%
Median	75.7%	75.4%	73.5%	73.2%	73.9%	3.1%	1.0%	0.3%
# States ≥ 0%						34	29	26
# States > 2%						29	24	19
# States ≤ -2%						16	21	24

Source: NAIC and author's calculations

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4.2.3. LOSS RATIOS

The third step in my analysis is to examine how loss ratios vary by income quartile. The loss ratio is equal to incurred losses divided by earned premiums and indicates the relationship between the premiums paid by insureds and claim costs paid to them or on their behalf. Hence, the loss ratio serves as an indicator of the “benefits” that insureds receive in return for the premiums they pay. All other things equal, a higher loss ratio indicates that insureds receive greater benefits in relation to what they pay for their insurance. Academics sometimes use the inverse of the loss ratio as a “unit price measure” as it indicates what insureds pay in relation to what they receive from their policies. The loss ratio also is used as an indicator of underwriting profits. A higher loss ratio indicates lower profits. If insurers were earning higher profits on the policies they sell to low-income drivers, we would expect to see lower loss ratios for low-income drivers.

Similar to Tables 2 and 3, Table 4 shows loss ratios by income quartile in each state. Additionally, for the purpose of comparison, I subtracted the loss ratios in the 2nd, 3rd, and 4th quartiles from the loss ratio in the lowest (1st) income quartile. I term this calculation the “loss ratio difference” (LRD) factor.

Table 4 reveals that loss ratios tend to be higher in the lowest quartile than in the other quartiles. As is the case for the average premium and pure premium, the loss ratios vary significantly across states. The mean value of the loss ratio is 75.0% for the lowest quartile, compared to 72.2% for the 2nd quartile, 73.1% for the 3rd quartile, and 72.7% for the highest quartile. The median value of the loss ratio is 75.4% for the lowest quartile, compared to 73.5% for the 2nd quartile, 73.2% for the 3rd quartile, and 73.9% for the highest quartile.

The mean values of my LRD factors indicate that the loss ratio in the lowest quartile is 2.7 percentage points higher than the loss ratio in the 2nd quartile, 1.9 percentage points higher than it is in the 3rd quartile, and 2.3 percentage points higher than it is in the highest quartile. Based on median values, the loss ratio in the lowest quartile is 3.1 percentage points higher than the loss ratio in the 2nd quartile, 1.0-percentage points higher than it is in the 3rd quartile, and 0.3 percentage points higher than it is in the highest quartile.

These results indicate that loss ratios vary inversely with income, i.e., loss ratios tend to be higher in the lowest quartile relative to the other quartiles. This suggests that drivers in low-income zip codes tend to have higher claims costs (i.e., receive greater benefits) in relation to the premiums they pay than drivers in higher-income zip codes. Hence, these results do not support the allegations that low-income drivers are overcharged in what they pay for coverage. These results also suggest that insurers earn lower (not higher) profits on policies sold to low-income drivers.

However, the general tendency for loss ratios to be higher in low-income zip codes than in other zip codes is not the case in all states. The loss ratio in the lowest quartile is higher than it is in the 2nd quartile in 37 states, higher than it is in the 3rd quartile in 32 states, and higher than it is in the highest quartile in 24 states. Because loss ratios that only differ marginally may be considered essentially equivalent, I also counted the number of states for which the loss ratio in the lowest quartile was greater or less than two percentage points of the loss ratios in the other quartiles. The loss ratio in the lowest quartile is greater by two percentage points or more than the loss ratio in the 2nd quartile in 29 states, the 3rd quartile in 24 states, and the highest quartile in 19 states. The loss ratio in the lowest quartile is two (or more) percentage points lower than the loss ratio in the 2nd quartile in 16 states, the 3rd quartile in 21 states, and the highest quartile in 24 states.

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Table 5
Loss Ratios with States Sorted by 1st Quartile Minus:

State	2nd Quartile	State	3rd Quartile	State	4th Quartile
DC	24.9%	DC	33.1%	DC	45.6%
New York	9.7%	Michigan	17.4%	Michigan	20.9%
Kentucky	9.4%	New Jersey	11.8%	New Jersey	16.9%
Connecticut	8.6%	Rhode Island	11.8%	Rhode Island	12.6%
New Jersey	8.5%	Delaware	9.1%	Maryland	11.5%
Missouri	8.5%	Maryland	8.8%	New York	11.5%
Michigan	8.1%	Connecticut	8.0%	Nevada	8.8%
Rhode Island	7.3%	Missouri	7.0%	Missouri	7.3%
South Dakota	7.2%	New York	6.7%	Kentucky	7.2%
Tennessee	6.5%	Wyoming	6.7%	North Carolina	6.9%
Minnesota	5.6%	Nebraska	6.1%	Delaware	6.7%
Louisiana	5.5%	Kentucky	6.0%	Connecticut	6.5%
De lawa re	5.0%	Minnesota	5.3%	Minnesota	6.3%
North Carolina	4.9%	South Carolina	4.5%	South Carolina	5.3%
Nebraska	4.8%	Wisconsin	4.0%	Wyoming	5.2%
Maryland	4.5%	Pennsylvania	3.9%	California	3.7%
Pennsylvania	4.3%	North Carolina	3.7%	Florida	2.7%
West Virginia	4.2%	New Hampshire	3.6%	PennsyMania	2.5%
Texas	4.1%	West Virginia	3.3%	Texas	2.1%
Mississippi	3.8%	Texas	3.0%	Louisiana	1.9%
New Hampshire	3.8%	California	2.9%	West Virginia	1.8%
Wisconsin	3.6%	Nevada	2.8%	Vermont	0.8%
Kansas	3.4%	Louisiana	2.7%	Virginia	0.8%
Wyoming	3.4%	Vermont	2.3%	Hawaii	0.7%
Ohio	3.2%	Ohio	1.5%	Utah	0.6%
Montana	2.9%	Hawaii	0.4%	Tennessee	0.0%
Arkansas	2.6%	Iowa	0.4%	Wisconsin	-0.2%
Nevada	2.3%	Tennessee	0.4%	Alaska	-0.6%
South Carolina	2.2%	Florida	0.1%	New Hampshire	-1.0%
Alabama	2.0%	Indiana	-0.3%	Ohio	-1.1%
Illinois	1.9%	South Dakota	-0.9%	Kansas	-1.4%
California	1.4%	Arkansas	-1.0%	Arkansas	-1.5%
Indiana	1.3%	Illinois	-1.0%	Nebraska	-1.6%
Vermont	1.2%	Alabama	-1.3%	Colorado	-1.9%
North Dakota	-0.3%	Colorado	-1.4%	North Dakota	-2.0%
Colorado	-0.4%	Montana	-1.5%	Montana	-2.1%
Florida	-1.2%	Kansas	-2.5%	Indiana	-2.2%
Oklahoma	-1.2%	Utah	-2.6%	Alabama	-2.9%
Virginia	-1.7%	Mississippi	-2.8%	South Dakota	-3.2%
Iowa	-1.8%	Oregon	-3.5%	Iowa	-3.3%
Idaho	-2.2%	North Dakota	-3.5%	Illinois	-3.3%
Alaska	-2.4%	Idaho	-3.8%	Washington	-4.5%
Maine	-2.5%	Oklahoma	-3.9%	Idaho	-5.1%
Hawaii	-2.7%	Maine	-4.4%	Maine	-5.2%
Washington	-3.4%	Virginia	-4.5%	Mississippi	-5.5%
Georgia	-3.5%	Washington	-5.8%	Oklahoma	-6.1%
Arizona	-3.7%	Arizona	-7.4%	Oregon	-6.4%
Utah	-5.1%	Alaska	-7.7%	Georgia	-6.6%
New Mexico	-5.3%	Georgia	-9.0%	Arizona	-7.8%
Oregon	-5.8%	New Mexico	-13.3%	New Mexico	-8.4%
Mean	2.7%	Mean	1.9%	Mean	2.3%
Median	3.1%	Median	1.0%	Median	0.3%

Source: NAIC and author's calculations

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Hence, in the minority of states, loss ratios in low-income zip codes are more than two percentage points less than the loss ratios in other zip codes. A number of factors could cause loss ratios in low-income areas to be higher or lower than loss ratios in other areas. Factors affecting average premiums and pure premiums are discussed above and these same factors will affect loss ratios in different ways. For example, factors that cause average premiums to be lower and pure premiums to be higher will cause loss ratios to be higher, all other things equal.

To gain some additional perspective on why we see differences in the relationship between income and loss ratios across states, I sorted states based on the difference between the loss ratio in the lowest quartile and the loss ratios in other quartiles as shown in Table 5. While it is difficult to draw any clear inferences from this sorting, I can offer at least one observation. The states in which the loss ratio is higher in low-income areas than it is in other areas tend to be those with more urban populations. It may be the case that in urban states (or states with large cities), a substantial proportion of low-income drivers live in urban areas where claim costs are particularly high. Insurers may have greater difficulty in charging adequate rates in these areas whether this is due to regulatory constraints or other factors.

Volatility in loss ratios also could affect these differences. Average premiums tend to be relatively stable over time (they could be trending up or down depending on insurers' pricing and consumers' choices) but pure premiums can be more volatile. Hence, volatility in pure premiums (claim costs) can cause volatility in loss ratios. Note that the figures provided by the NAIC are aggregated over a five-year period, which should reduce the volatility in claim costs and loss ratios but not necessarily eliminate it. Volatility in loss ratios could affect the income quartile comparisons, e.g., severe floods in high-income areas could result in high OTC claims in these areas, which would cause the loss ratio to spike in these areas. A number of other factors could affect these differences across states, which could be explored in further analysis beyond the scope of this report.



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4.2.4. PURE PREMIUMS FOR LIABILITY COVERAGES

As discussed above, the NAIC report aggregates all coverages for its figures on average premiums, pure premiums, and loss ratios by income quartile. However, the report also provides the number of exposures by the type of coverage and statistics on claim frequency and severity for liability coverages by income quartile. This enabled me to calculate pure premiums for Bodily Injury Liability (BIL) and Property Damage Liability (PDL) by income quartile. These calculations are of some interest as they provide additional insights into how claim costs vary with income.

Table 6 shows the results of my calculations for BIL pure premiums; figures for Hawaii and North Dakota were not legible in the NAIC report so my calculations reflect only the remaining states. My results indicate that BIL pure premiums for the lowest quartile tend to be higher than they are for the other quartiles. The mean value for this metric is \$190 for the lowest quartile, \$169 for the 2nd quartile, \$173 for the 3rd quartile, and \$178 for the highest quartile. The median value for this metric is \$157 for the lowest quartile, \$142 for the 2nd quartile, \$158 for the 3rd quartile, and \$150 for the highest quartile.

Correspondingly, the mean value of the IQR is 112.5% for the 2nd quartile, 110.1% for the 3rd quartile, and 108.7% for the highest quartile. The median value of the IQR is 109.2% for the 2nd quartile, 103.6% for the 3rd quartile, and 99.8% for the highest quartile. If drivers living in zip codes in the lowest quartile tend to purchase lower liability limits than other drivers, this suggests that claim costs are particularly high in these zip codes due to factors other than the BIL limits that drivers choose.

However, as with the pure premiums for all coverages combined, this pattern is not consistent across all states. Out of 48 states, the BIL pure premium in the lowest quartile is higher than it is in the 2nd quartile in 37 states, higher than it is in the 3rd quartile in 28 states, and higher than it is in the highest quartile in 23 states.



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Table 6
Bodily Injury Liability Pure Premium by Income Quartile

State	Income Quartiles					1st Quartile Minus :		
	No Income	1st	2nd	3rd	4th	2nd	3rd	4th
Alabama	\$124	\$142	\$132	\$146	\$158	107.5%	97.3%	89.6%
Alaska	\$189	\$141	\$132	\$172	\$147	106.8%	82.2%	96.1%
Arizona	\$179	\$180	\$187	\$210	\$212	96.4%	85.9%	84.9%
Arkansas	\$130	\$111	\$101	\$111	\$111	109.6%	99.9%	99.7%
California	\$157	\$152	\$149	\$149	\$151	102.3%	102.3%	100.7%
Colorado	\$213	\$176	\$181	\$186	\$192	97.6%	94.9%	91.8%
Connecticut	\$274	\$353	\$256	\$241	\$245	137.5%	143.9%	146.5%
Delaware	\$142	\$263	\$244	\$214	\$252	107.6%	122.8%	104.5%
DC	\$281	\$390	\$234	\$190	\$129	166.6%	205.0%	302.2%
Florida	\$180	\$261	\$224	\$185	\$148	116.7%	141.4%	176.6%
Georgia	\$771	\$227	\$241	\$278	\$266	94.3%	81.9%	85.3%
Hawaii	NA	NA	NA	NA	NA	NA	NA	NA
Idaho	\$99	\$114	\$124	\$121	\$124	91.4%	94.2%	91.3%
Illinois	\$304	\$156	\$144	\$160	\$170	108.1%	97.7%	91.8%
Indiana	\$123	\$129	\$119	\$123	\$131	108.8%	104.9%	98.9%
Iowa	\$80	\$87	\$87	\$80	\$90	99.3%	108.6%	96.3%
Kansas	\$100	\$113	\$97	\$111	\$114	116.1%	101.3%	99.3%
Kentucky	\$187	\$221	\$158	\$168	\$175	139.9%	131.9%	126.0%
Louisiana	\$341	\$407	\$398	\$411	\$458	102.2%	98.8%	88.8%
Maine	\$102	\$95	\$107	\$110	\$111	89.1%	86.5%	85.9%
Maryland	\$174	\$258	\$240	\$202	\$186	107.3%	127.3%	138.8%
Michigan	\$351	\$426	\$453	\$458	\$415	94.1%	93.0%	102.6%
Minnesota	\$73	\$91	\$80	\$84	\$91	113.4%	108.0%	100.0%
Mississippi	\$143	\$171	\$143	\$168	\$182	119.5%	101.9%	93.6%
Missouri	\$170	\$169	\$141	\$148	\$149	120.0%	114.8%	114.1%
Montana	\$133	\$124	\$106	\$125	\$121	116.9%	99.0%	102.2%
Nebraska	\$111	\$132	\$104	\$93	\$130	126.9%	142.5%	101.8%
Nevada	\$328	\$371	\$352	\$347	\$287	105.7%	107.0%	129.3%
New Hampshire	\$109	\$128	\$117	\$115	\$133	109.7%	111.1%	95.9%
New Jersey	\$312	\$268	\$218	\$208	\$366	122.7%	129.2%	73.1%
New Mexico	\$151	\$116	\$136	\$161	\$153	85.5%	72.1%	76.0%
New York	\$282	\$240	\$186	\$239	\$256	129.1%	1006.0%	93.6%
North Carolina	\$152	\$144	\$125	\$132	\$125	115.7%	108.9%	115.7%
North Dakota	NA	NA	NA	NA	NA	NA	NA	NA
Ohio	\$114	\$158	\$126	\$127	\$127	125.0%	124.5%	124.1%
Oklahoma	\$112	\$126	\$126	\$133	\$142	100.5%	95.4%	88.8%
Oregon	\$160	\$171	\$196	\$199	\$230	87.2%	85.9%	74.4%
Pennsylvania	\$162	\$149	\$110	\$111	\$132	134.8%	134.5%	113.1%
Rhode Island	\$698	\$418	\$266	\$234	\$216	157.1%	178.9%	193.3%
South Carolina	\$119	\$253	\$231	\$208	\$201	109.8%	121.9%	125.8%
South Dakota	\$119	\$87	\$69	\$95	\$97	126.2%	92.0%	89.4%
Tennessee	\$110	\$148	\$113	\$130	\$147	130.7%	113.4%	100.4%
Texas	\$210	\$198	\$181	\$184	\$191	108.8%	107.5%	103.3%
Utah	\$128	\$205	\$171	\$232	\$235	119.6%	88.3%	87.2%
Vermont	\$70	\$104	\$98	\$94	\$96	106.1%	110.2%	107.5%
Virginia	\$137	\$157	\$150	\$157	\$154	104.4%	100.0%	101.9%
Washington	\$230	\$166	\$191	\$206	\$212	87.0%	80.9%	78.7%
West Virginia	\$134	\$179	\$140	\$142	\$136	127.9%	125.9%	131.1%
Wisconsin	\$129	\$155	\$128	\$124	\$138	120.8%	124.8%	112.4%
Wyoming	\$75	\$87	\$96	\$87	\$91	89.7%	99.8%	95.3%
Mean	\$191	\$190	\$169	\$173	\$178	112.5%	110.1%	108.7%
Median	\$147	\$157	\$142	\$158	\$150	109.2%	103.6%	99.8%
# States > 100%						37	28	23
# States ≤ 100%						11	20	25

Source: NAIC and author's calculations

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Table 7 provides similar calculations for PDL pure premiums; figures for North Dakota and Utah were not legible in the NAIC report so my calculations reflect only the remaining states. My results indicate that PDL pure premiums for the lowest quartile tend to be higher than they are for the other quartiles but this relationship between income and pure premiums is not as strong or consistent as it is for BIL coverage. The mean value for this metric is \$136 for the lowest quartile, \$127 for the 2nd quartile, \$129 for the 3rd quartile, and \$135 for the highest quartile. The median value for this metric is \$116 for the lowest quartile, \$115 for the 2nd quartile, \$126 for the 3rd quartile, and \$140 for the highest quartile.

The mean value of the IQR is 106.9% for the 2nd quartile, 106.0% for the 3rd quartile, and 103.6% for the highest quartile. The median value of the IQR is 101.6% for the 2nd quartile, 96.0% for the 3rd quartile, and 90.8% for the highest quartile. The fact that the association between income and the PDL pure premium is not as strong or consistent as it is for the BIL pure premium should not be surprising. It is reasonable to expect that low-income drivers purchase lower PDL limits than high-income drivers, all other things equal. More importantly, we would expect that the market values of vehicles are lower in low-income zip codes than in high-income zip codes. If this were true, it would cause PDL pure premiums to be lower in low-income zip codes, all other things equal.

Finally, we can look at the number of states for which the PDL pure premium in the lowest quartile is higher than it is in the other quartiles. Out of 48 states, the PDL pure premium in the lowest quartile is higher than it is in the 2nd quartile in 30 states, higher than it is in the 3rd quartile in 22 states, and higher than it is in the highest quartile in 16 states. These counts are consistent with the observation that the relationship between income and PDL pure premium is not as strong as it is for the BIL pure premiums.

4.2.5. SUMMARY

Taken together, the results of my analysis indicate that average premiums, pure premiums (claim costs), and loss ratios tend to be higher in low-income areas than in other areas. These results are consistent with the contention that low-income drivers tend to pay more for auto insurance because their claim costs tend to be higher, all other things equal. Hence, the results of my analysis are consistent with previous studies that have not found evidence that insurers engage in unfair discrimination against low-income drivers (or the areas where they live) when what is considered “fair” is based on economic, insurance, and actuarial principles. My results are also consistent with what we would expect to see in competitive auto insurance markets.

However, there are caveats to these general observations. The relationships between income and premiums, claim costs, and loss ratios are not consistent across all states. Further, I could not control for factors that affect these relationships such as the coverages that insureds purchase. This underscores the point that it is necessary to perform a more rigorous and in-depth analysis with more granular data to develop a proper understanding of the market conditions in any given state with respect to what different groups of consumers pay for auto insurance and why they pay what they pay.

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Table 7
Property Damage Liability Pure Premium by Income Quartile

State	Income Quartiles					1st Quartile ÷:		
	No Income	1st	2nd	3rd	4th	2nd	3rd	4th
Alabama	\$124	\$115	\$114	\$120	\$141	100.7%	95.7%	81.7%
Alaska	\$129	\$102	\$146	\$140	\$134	69.9%	72.8%	76.3%
Arizona	\$134	\$135	\$134	\$149	\$151	100.6%	90.9%	89.7%
Arkansas	\$135	\$112	\$115	\$130	\$148	96.9%	85.7%	75.7%
California	\$156	\$137	\$141	\$147	\$154	97.1%	93.3%	89.0%
Colorado	\$141	\$130	\$141	\$143	\$141	92.0%	90.8%	91.7%
Connecticut	\$171	\$194	\$155	\$146	\$157	125.3%	132.6%	123.2%
Delaware	\$182	\$161	\$154	\$140	\$160	104.3%	114.7%	100.4%
DC	\$221	\$272	\$196	\$161	\$145	138.8%	169.4%	188.0%
Florida	\$155	\$157	\$154	\$152	\$153	101.6%	103.0%	102.5%
Georgia	\$400	\$140	\$149	\$168	\$184	94.2%	83.4%	76.1%
Hawaii	\$125	\$135	\$134	\$123	\$136	100.6%	110.0%	99.2%
Idaho	\$96	\$90	\$100	\$101	\$104	90.2%	89.5%	86.7%
Illinois	\$195	\$123	\$121	\$134	\$146	101.6%	92.0%	84.2%
Indiana	\$117	\$115	\$96	\$104	\$120	120.4%	110.7%	95.8%
Iowa	\$99	\$98	\$93	\$94	\$104	105.2%	103.8%	94.2%
Kansas	\$33	\$39	\$34	\$34	\$29	113.0%	115.1%	133.4%
Kentucky	\$77	\$117	\$69	\$72	\$57	168.6%	162.4%	203.1%
Louisiana	\$181	\$197	\$202	\$204	\$217	97.6%	96.4%	90.7%
Maine	\$103	\$75	\$84	\$84	\$92	89.5%	89.9%	81.9%
Maryland	\$67	\$88	\$66	\$49	\$36	132.7%	178.4%	241.5%
Michigan	\$1,138	\$555	\$444	\$361	\$321	125.1%	153.7%	172.9%
Minnesota	\$106	\$124	\$97	\$98	\$94	128.7%	126.8%	132.1%
Mississippi	\$111	\$112	\$109	\$118	\$139	102.8%	95.1%	80.9%
Missouri	\$151	\$116	\$110	\$122	\$142	105.8%	95.5%	81.5%
Montana	\$97	\$81	\$94	\$99	\$102	86.4%	823.0%	79.2%
Nebraska	\$130	\$120	\$112	\$89	\$132	107.6%	135.6%	90.8%
Nevada	\$143	\$161	\$149	\$150	\$131	108.0%	107.5%	122.4%
New Hampshire	\$123	\$116	\$125	\$121	\$132	93.4%	96.3%	88.4%
New Jersey	\$178	\$182	\$163	\$164	\$159	111.6%	111.4%	114.3%
New Mexico	\$116	\$83	\$97	\$120	\$122	85.7%	69.3%	68.4%
New York	\$242	\$183	\$157	\$176	\$200	116.5%	104.1%	91.5%
North Carolina	\$127	\$114	\$113	\$124	\$137	100.8%	91.4%	83.0%
North Dakota	NA	NA	NA	NA	NA	NA	NA	NA
Ohio	\$113	\$132	\$112	\$113	\$127	117.2%	116.8%	103.9%
Oklahoma	\$127	\$127	\$127	\$136	\$151	99.7%	92.8%	83.8%
Oregon	\$116	\$109	\$122	\$129	\$149	89.3%	84.4%	73.0%
Pennsylvania	\$47	\$82	\$54	\$49	\$46	152.8%	167.7%	176.8%
Rhode Island	\$332	\$283	\$218	\$200	\$188	129.9%	141.3%	150.2%
South Carolina	\$94	\$135	\$136	\$142	\$151	99.1%	95.3%	89.6%
South Dakota	\$119	\$84	\$72	\$94	\$88	117.2%	89.0%	95.7%
Tennessee	\$111	\$116	\$105	\$128	\$142	110.9%	90.9%	82.1%
Texas	\$193	\$167	\$176	\$188	\$213	94.8%	88.5%	78.1%
Utah	NA	NA	NA	NA	NA	NA	NA	NA
Vermont	\$91	\$97	\$89	\$92	\$100	108.8%	105.2%	96.9%
Virginia	\$120	\$102	\$110	\$128	\$150	92.4%	79.5%	67.7%
Washington	\$140	\$114	\$123	\$134	\$150	92.4%	85.1%	75.9%
West Virginia	\$109	\$97	\$103	\$112	\$114	93.5%	86.4%	84.7%
Wisconsin	\$89	\$99	\$84	\$88	\$98	118.2%	112.7%	101.2%
Wyoming	\$86	\$105	\$104	\$104	\$103	100.1%	100.7%	101.2%
Mean	\$158	\$136	\$127	\$129	\$135	106.9%	106.0%	103.6%
Median	\$124	\$116	\$115	\$126	\$140	101.6%	96.0%	90.8%
# States > 100%						30	22	16
# States ≤ 100%						18	26	32

Source: NAIC and author's calculations

5. CONCLUSIONS

Issues regarding the availability and cost of auto insurance for minority and low-income drivers continue to garner attention. Consumer groups contend that “unfair discrimination” by insurance companies in their underwriting and pricing practices is a significant contributor to reduced availability and higher premiums for these drivers. Industry representatives and many (but not all) regulators strongly disagree that insurers treat minority and low-income drivers unfairly. They argue that differences in risk and other cost-related factors are responsible for disparities in premiums among different groups of consumers and their sources of coverage. This debate over alleged redlining in auto insurance parallels a similar debate regarding redlining in home insurance.

Over the years, there have been a number of studies of redlining in auto and home insurance. Studies conducted by consumer advocates and some academics outside the fields of insurance and economics conclude that there is evidence of redlining in both lines of insurance. On the other side, insurance economists have not found evidence of unfair discrimination by insurers with respect to pricing, e.g., loss ratios in areas where there is a high proportion of minority and/or low-income households are similar or even higher than loss ratios in other areas controlling for other variables. They are more cautious in their conclusions regarding the availability of insurance. They cannot rule out the possibility that certain industry practices make it more difficult for some consumers to purchase the coverage they need or want, but their analysis indicates that this is more likely due to risk factors than unfair discrimination.

Most studies conducted by state insurance departments have reached similar conclusions, although there are some that contend that there is evidence of redlining. Additionally, the NAIC has conducted a number of studies of the availability and affordability of personal insurance with mixed results. The NAIC committees that have investigated these issues have stopped short of drawing firm conclusions regarding the existence of redlining but have opined that various factors are responsible for disparities in the availability and cost of insurance, including but not limited to risk/cost conditions and industry practices.

As the redlining debate enters a new phase, there could be real consequences for consumers, insurance companies, and regulators. Specifically, more states may consider enacting bans on certain rating factors such as credit scores. Indeed, the U.S. Congress could also enact legislation affecting industry practices. If such measures are badly informed and constrain legitimate and reasonable practices, significant market distortions could result. Hence, gaining a better understanding of the availability and affordability problems faced by certain consumers and their causes will be critical to informing good policy decisions.

In this vein, this report reviews important economic, insurance, and regulatory principles and presents an analysis of how certain market outcomes in auto insurance vary with income. Specifically, using figures presented in the NAIC report, I construct tables that indicate how average premiums, pure premiums, and loss ratios vary by income quartile in each state. While this analysis is considerably less rigorous and granular than the economic studies conducted two decades ago as well as the recent Missouri study, it does provide some information that is more current (and goes beyond one state) and helps to inform the debate on unfair discrimination.

From an economic perspective, there must be some form of market failure for price discrimination to occur. Three conditions must be met for sellers to engage in price discrimination. One, the seller must have some control over prices, i.e., some degree of market power. Economic price discrimination cannot occur in a perfectly competitive market and, arguably, nor in a monopolistically competitive market that meets the conditions for workable competition. Two, the price discriminator must be able to segregate its customers into groups with different elasticities of demand, or into discrete classes with varying reservation prices (the highest prices buyers will pay for any specific unit of output). Three, opportunities for arbitrage — resale by low-price consumers to high-price consumers — must be constrained.

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While auto insurance markets satisfy the third condition, arguably, they do not meet the first two conditions. State auto insurance markets tend to have low levels of concentration, low entry and exit barriers, and profits that do not exceed a fair rate of return. Auto insurance markets do suffer from information problems to some degree. Some consumers may have some difficulty in comparing prices and products from different insurers. Additionally, insurers can only estimate the expected cost of insuring a specific driver. However, in order for insurers to profit from discriminating against low-income or minority consumers, their demand for coverage would need to be less elastic than it is for other consumers, which is contrary to what we would expect. An insurer could overcharge certain consumers based on irrational and erroneous biases, but this could undermine its business objectives. Whether motivated by profits or irrational bias, there would need to be some form of market friction that would allow an insurer to overcharge some of its insureds without losing these customers to other insurers.

Auto insurers' rates and market practices are also subject to regulation. Regulatory standards require that rates not be excessive, inadequate, or unfairly discriminatory. These standards are generally consistent with actuarial principles governing the pricing of insurance. If an insurer's rates were unfairly discriminatory, they would violate regulatory standards as well as actuarial principles. Consequently, we would not expect that regulators would allow insurers to charge unfair rates unless they were unable to determine their fairness or were biased in some way against the interests of consumers.

The results of my analysis are consistent with the findings of insurance economists and inconsistent with the allegations of consumer groups with respect to whether there is evidence of redlining. If insurers overcharge low-income drivers (and by implication minority drivers), then loss ratios should be lower for low-income drivers than they are for high-income drivers. My results indicate that the opposite is more likely. Loss ratios tend to vary inversely with income, indicating that low-income drivers receive more benefits in relation to the premiums they pay than other drivers do. Additionally, my results suggest that low-income drivers tend to pay higher premiums but their claim costs also tend to be higher.

However, these general patterns are not consistent across all states; in some states loss ratios vary directly with income and average premiums and average loss costs vary inversely with income. Because my data are aggregated by income quartile, I could not control for other factors that are associated with the variables of interest. Additionally, my analysis does not provide any insight on whether low-income consumers face greater difficulty in obtaining adequate auto insurance. Hence, it is necessary to perform a more rigorous multivariate analysis with more granular data to gain insight into the market conditions in any given state.

The whole of the economic discussion and analysis presented in this report, combined with the literature on the topic of unfair discrimination, recommend that regulators and legislators should exercise caution in considering further constraints on insurers' pricing and underwriting. If availability and/or affordability are problems for some consumers, policymakers should consider a broad array of regulatory and other policy measures with a thorough understanding of market conditions based on sound research. There are a number of publications that discuss regulatory and policy measures as well as industry initiatives that have or could be employed to improve the availability and lower the cost of auto and home insurance for low-income consumers and urban areas.⁴⁸ Research on the effects of these measures also could inform policymakers on what more can be done.

⁴⁸ See, for example, NAIC (1996) and NAIC (2014).

STATEMENT OF THE CASUALTY ACTUARIAL SOCIETY

Members of the Casualty Actuarial Society (CAS) reviewed this work and provided recommendations for improvement and further research. We thank NAMIC for giving us the opportunity to share our thoughts and reactions. This is a well-researched academic work, and the background and review of prior studies is clearly explained and will serve as a resource to many others hoping to complete similar research in the future. Dr. Klein's analysis is focused solely on an examination of policy premium and profitability (loss ratio), by household income quartiles. While these issues are entangled with the problem of racial, ethnic and/or other insurance rating biases, the paper does not treat those biases specifically, nor does it purport to. Dr. Klein is clear about this approach. Establishment of a statistically measurable link between unfair price discrimination and race would require different data, though similar analysis.

The Casualty Actuarial Society ensures that its members and candidates produce work that serves the public and adheres to a high standard of professionalism. Additionally, the CAS has long pursued efforts to enhance diversity and inclusion among members, candidates, and CAS staff. Both these elements support the CAS's interest in ongoing conversations about disparate impact in personal insurance in the United States. The CAS can play a useful role in providing objective work to inform such discussions. Though most of its members work in the insurance industry, the CAS does not speak for, nor lobby on behalf of, NAMIC or the insurance industry.



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