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Auto Insurance Affordability

Patrick Schmid, Ph.D.

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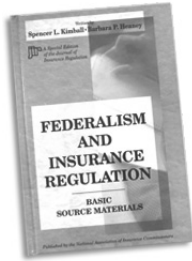
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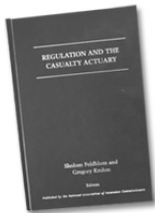
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Auto Insurance Affordability

Patrick Schmid, Ph.D.*

Abstract

The downtrodden economy has cast a spotlight on affordability issues in a variety of industries, including automobile insurance. Unfortunately, affordability is not a straightforward subject to study, nor does it have a uniform methodological framework. This study seeks to present a simple, logical and quantifiable methodological definition for automobile insurance affordability. Once the definition is created, national and state trends are inspected, which indicate a gradual improvement in auto insurance affordability over time and across most states. Correlations amongst variables thought to be potential drivers of state auto insurance affordability are also presented. These variables are then included in a state panel regression model, which is estimated. The results indicate that auto insurance affordability is driven by the state's regulatory regime, competitive make-up, residual market size, generosity of the injury reward system and the underlying economy.

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Introduction

The stress on the economy continues to weigh on Americans, particularly the working class. As it stands, real median household income has declined for five straight years, currently down 9% in 2012 from the peak achieved in 1999 (DeNavas-Walt, Proctor and Smith, 2013). The drag on incomes, along with moderate inflation, provides a heavy constraint for consumer activity among low-income individuals (many of whom are unemployed).

As real income declines, prices of consumer staples—such as automobile insurance—may appear less affordable. This has led to an increase in interest from policymakers regarding auto insurance affordability, particularly the cost of insurance for low-income drivers. For example, in April 2014, the Federal Insurance Office (FIO) posted a request for comments on how it should define and monitor the availability of affordable auto insurance in minority and low- and moderate-income communities (Federal Insurance Office, 2014). Prior to the FIO's request, the NAIC Auto Insurance (C/D) Study Group had also looked into the matter (National Association of Insurance Commissioners, 2014). The efforts assume there is an issue with the cost of insurance for low-income drivers that needs to be addressed. As it stands, there is limited evidence of an improvement or deterioration in regard to auto insurance affordability.

Thus far, little consensus has been reached on the topic of affordability as the interested parties involved have not agreed upon a definition and, as a result, reach different conclusions. For example, the Consumer Federation of America, which has been actively involved in these discussions, generally suggests that rates are not affordable for low- and moderate-income drivers (Consumer Federation of America, 2014). Meanwhile, several insurance trade organizations—such as the Property Casualty Insurers Association of America (PCI), National Association of Mutual Insurance Companies (NAMIC) and the American Insurance Association (AIA)—have generally countered that auto insurance affordability is mostly improving across income groupings.

Even if it was proven there was a decline in affordability, if the decline in affordability is due to lower incomes (not price increases), the situation cannot improve without a fundamental turnaround within the broader economy. Because of this fact, income changes are pivotal variables to consider within a dialogue on affordability, and any research on affordability should take into account income, as well as expenses.

The effects of the economic downturn may be a catalyst for the increased scrutiny of auto insurance affordability. In addition, the increased interest may also be due to the vague definition of affordability and the regulatory objectives within the auto insurance industry. Indeed, some may mistakenly include the term "affordability" within the context of the standards of insurance regulation. The terms *"not excessive," "*inadequate" or "unfairly discriminatory" are used in statutes as the underlying rate objectives or standards of auto insurance rate

regulation.[1] The presence of affordability, defined as "being within the financial means of most people"[2] may be inappropriate if the statute does not direct the regulator to consider this.

The topic of affordability is difficult to study. Many industries—including health care, real estate and retail—have grappled with this topic for decades using diverse methods to identify and measure affordability. Insurance is no different. The existing literature on auto insurance affordability is diverse[3], and there is little consensus on a singular method of defining affordability given existing data. Despite the current economic environment and the troubles in aligning the term affordability to the standards of insurance regulation, the term and its proper meaning are important to any macro-related study of automobile insurance. However, measuring insurance affordability in general is complex, and creating a methodology to study the concept through the lens of one particular income group (for example, low income) only compounds the complexity. This study seeks to add to the available research regarding auto insurance affordability by using a singular definition of affordability that includes financial means, analyzing the data trends and studying which factors may cause affordability changes within the auto insurance industry.[4]

The remainder of the study is organized as follows. First, the methodology is explained. National trends over time will be inspected, indicating whether insurance affordability has improved or worsened. An adjustment to the affordability index will also be made in order to gauge its effectiveness in measuring low-income individuals and, again, a national trend analysis will be provided. A state analysis will be presented, offering insight into affordability trends for states over time. Finally, variables that may be drivers of auto insurance affordability are examined, and a multivariate model that may help further explain causal alterations in affordability over time and across states is estimated.

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1. A rate is considered excessive if the rate is likely to produce a long-term profit that is unreasonably high in relation to the insurance coverage provided. A rate is considered inadequate if the rate is insufficient to sustain projected losses and expenses to which the rate applies and if continued use of the rate endangers the solvency of the insurer or alters market concentration. Finally, a rate is considered unfairly discriminatory if the rate is not based on actuarially sound principles; does not bear a reasonable relationship to expected loss and expense experience among risks; or is based wholly or partially on race, creed, color, ethnicity or national origin of the policyholder.

2. The definition of "affordable" was retrieved Sept., 4, 2014, from *www.merriam-webster.com/thesaurus/affordable*.

3. See, for example, Harrington, 1991; Rosenfield, 1998; and Tennyson, 2002.

4. The approach of comparing expenditures to income has been analyzed in the past. See, for example: Insurance Information Institute, 2012 Risk Information, Inc., 2014.

Defining Affordability

To measure auto insurance affordability, data was gathered, and a proxy was developed for the fraction of total income that is used to pay for insurance. The National Association of Insurance Commissioners (NAIC) releases data on average insurance expenditures both nationally and by state in its *Auto Insurance Database Report*. Although the report was released in late-2012, the insurance expenditure data are heavily lagged, as the most recent data are from 2010.[5] Data on median household income were obtained from the U.S. Census Bureau.[6] As shown in equation 1, the insurance expenditure to income ratio is simply the average insurance expenditure over the median household income:

(Equation 1) $R_{it} = \frac{E_{it}}{I_{it}}$

- Where R_{it} is geography i's insurance expenditure to income ratio at time t
- Where E_{it} is geography i's average insurance expenditure at time t
- Where I_{it} is geography i's median household[7] income at time t

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5. It should be noted that the expenditure data are only available as an average. As a result, it is implicitly assumed that expenditures on auto insurance for all incomes are equal to the average provided by the NAIC. Given that income can affect insurance purchase decisions, such as the types of coverages selected and/or coverage amounts, and age and other rating factors can vary across income levels, it is possible that insurance expenditures vary across income levels. Some available data, such as data published by the Consumer Expenditure Survey, support the notion that expenditures vary across income levels. Interestingly, the CES data also support the findings within this report that show median income individuals pay roughly 2% of their income on average for auto insurance (see Figure 2), and low income individuals pay roughly 4% of their income for auto insurance on average (see Figure 4). In conclusion, a study at the state level using NAIC auto insurance expenditure data, which has the aforementioned data limitations, is not able to provide specific information as to whether "affordability" varies across income levels unless the assumption that all income levels pay the same expenditure is made.

6. Data was obtained from the U.S. Census Bureau at *www.census.gov/hhes/www/income/*.

7. Median income is preferred to mean income when the data is not symmetrically distributed, as is the case with U.S. incomes. Moreover, average household income is not available at the state level.

Figure 1:
Growth in Income Outpaced Insurance Expenditures
Growth for Decades
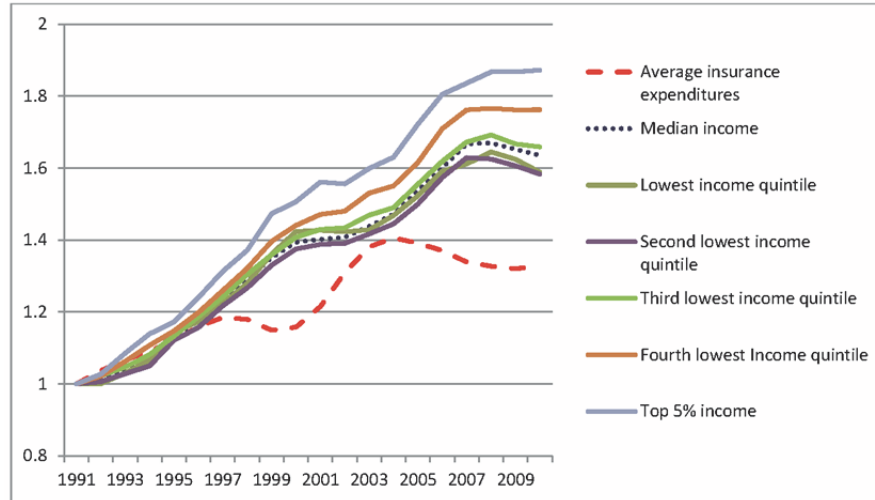
Under this methodology, affordability would improve if the insurance expenditure to income ratio, R, goes down in a specific geography, i, at a particular time, t. Conversely, affordability would worsen if the insurance expenditure to income ratio, R, went up in a specific geography, i, at a particular time, t. Hence, the insurance expenditure to income ratio provides an inverse affordability measurement.

Before inspecting the trends in the insurance expenditure to income ratio, it is helpful to look at expenditure and income trends over time. In Figure 1, the average insurance expenditures' nominal value and median income's nominal value are indexed to 1991. Income quintile data's nominal value, collected from the U.S. Census Bureau, are also indexed to 1991. Therefore, 1991 is set equal to one for each value, which helps underscore the growth over time in each value.

As shown in Figure 1, growth in average insurance expenditures appears to move inversely with growth in income. The similar growth trends among income groupings are also highlighted in the figure. Indeed, the quintile income groupings tend to move in a similar manner to median income. In fact, the lowest groupings (lowest income quintile, second lowest income quintile and third lowest income quintile) move closely in line with changes in median income. This is important to note because it implies that changes in median income can be used as a proxy for changes in low-income (quintile) data when those data are not available.[8]

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8. Low income (quintile) data are not consistently available over time at the state level.

Figure 2:
Trends Indicate an Improvement in Affordability
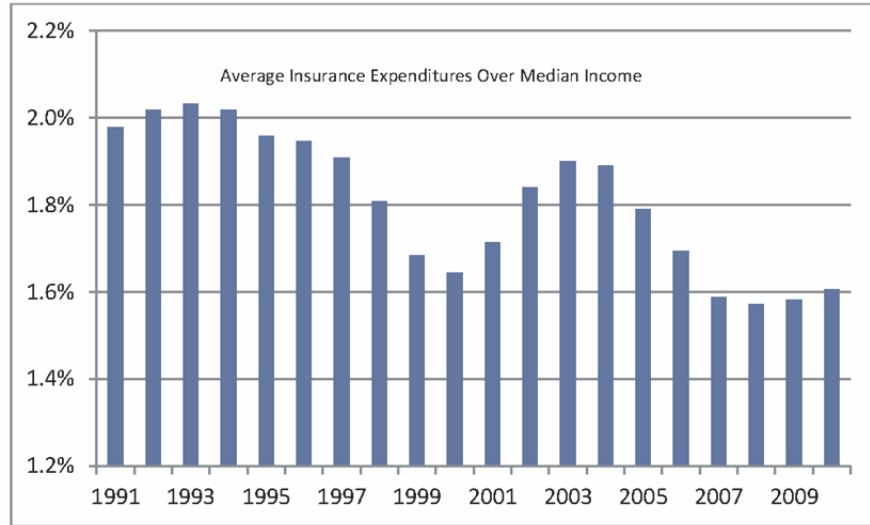
Trends in Affordability

National Trends

In this section, the trends in the national insurance expenditure-to-income ratio are inspected. First, the index using median income is analyzed. Subsequently, a low-income variant is also presented. The goal will be to see whether affordability has improved over time (the index fell) or affordability worsened over time (the index rose).

When the average insurance expenditure to median income index over time (see Figure 2) is analyzed at the national level, a fairly long downward trend is revealed. In the early 2000s, the trend slid up somewhat, but it began declining again after 2003 and hit new low points in the late 2000s. The long-term trend was a decline, which implies improved affordability. In the late 2000s, near the end of the available data's history, affordability established a new 20-year low and has held relatively steady since.

In Figure 3, the decades are studied independently. Here, the insurance expenditure to median income index is averaged over each decade—the 1990s and the 2000s. A clear decline in the index, or increase in affordability, is indicated in the 2000s. In fact, there was a 9.5% decline in the index across the two periods, implying a strong improvement in affordability from decade to decade.

Figure 3:
Average Insurance Expenditure to Income Ratio (Median)
Fell from the 1990s to 2000s
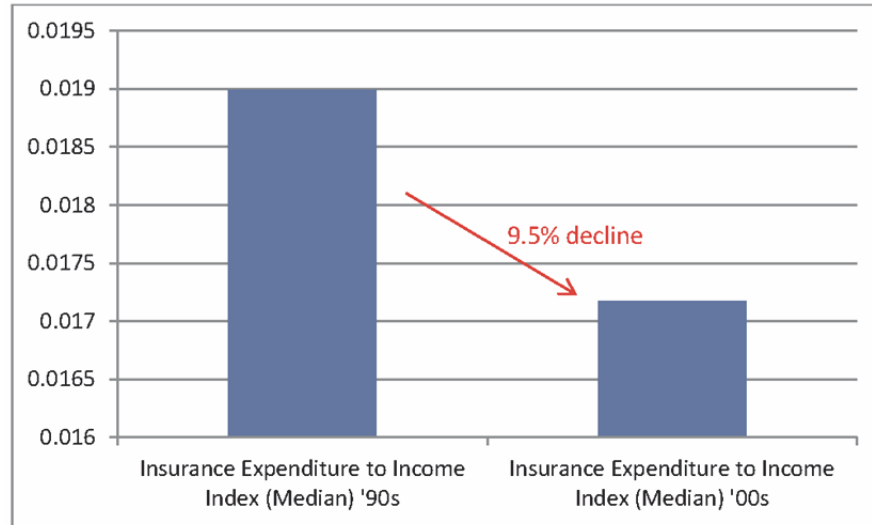
The insurance expenditure to income ratio fell over time using median income, implying that an average person was paying less relative to his or her income for automobile insurance. Since much of the current focus on affordability is directed to low-income individuals, the lowest income quintile can be substituted for median income within the index. This creates an average insurance expenditure to low-income ratio, which can be thought of as an auto insurance affordability proxy for low income households. This is shown in Figure 4.

In Figure 4, another long-term downward trend is presented. Using the lowest income quintile, the insurance expenditure to income ratio fell over time, implying that affordability was improving over time. As in Figure 2, there was a slight increase in the early 2000s, but it reversed in 2004 and resulted in a further decline into the late 2000s. The long-term trend of improving affordability is evident. Indeed, like the insurance expenditure to median income ratio, the insurance expenditure to low-income ratio hit 20-year lows in the late 2000s and only moderately increased since.

The 1990s and the 2000s are again studied independently in Figure 5. Here, the average insurance expenditure to lowest income quintile index is averaged over each decade. A clear decline in the index, or increase in affordability, is indicated in the 2000s. In fact, there was a 9% decline in the index across the two periods, implying a strong improvement in affordability from decade to decade for those in the lowest income quintile.

Figure 4:
Trends Also Indicate Improvement in Affordability for Low-Income
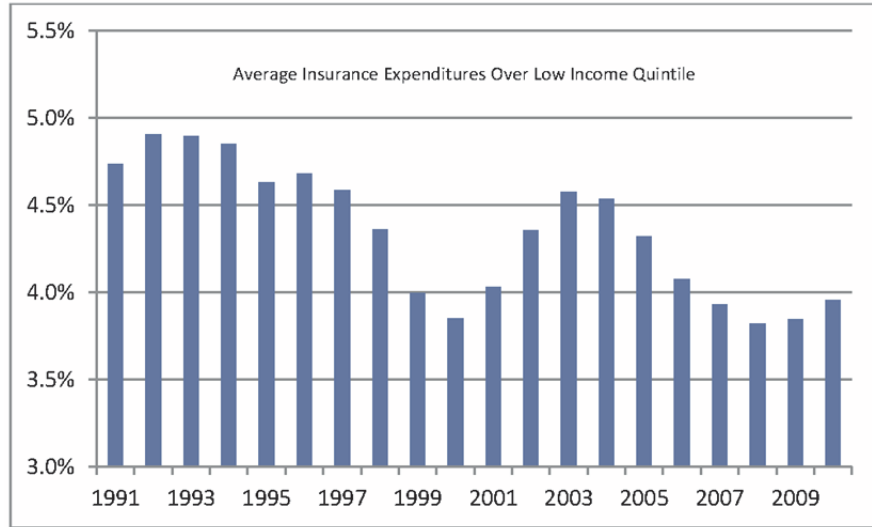
State Trends

The national data indicate that insurance has become more affordable in recent years. The goal in this section will be similar to the national section in that affordability over time will be studied. Like the national data, the state average insurance expenditure data are obtained from the NAIC. It should be noted that consistent, reliable income quintile data do not exist in the time-series format by each year at the state level.[9] Nevertheless, median income does exist in this format at the state level. It was shown in Figure 1 that median income trends moved with those for lower-income quintiles and, as such, should be considered a reasonable proxy. Therefore, changes in each state's average insurance expenditure to median income index not only tell the story of state insurance affordability for middle-income individuals, but could also be viewed as a proxy for changes in low-income affordability.

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9. Income quintiles are calculated from the reported household incomes of a survey's sample population, and, as such, surveys with different sample populations may have different income quintile thresholds. More specifically, state Survey of Income and Program Participation quintile data and state American Community Survey quintile data do not match. More importantly, the data are not available annually, which is necessary for a longitudinal analysis.

Figure 5:
Average Insurance Expenditure to Income Ratio (Lowest Quintile)
Fell from the 1990s to 2000s
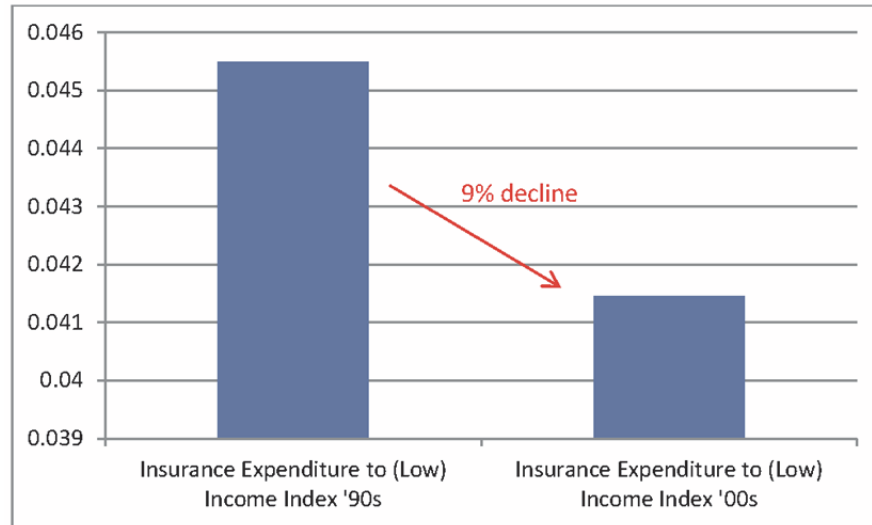
The presentation in this section will also differ from the national section in that presenting a detailed time trend for each of the 50 states would be too elaborate. Instead, maps can be used to describe the changes over time. Similar to the analysis in Figure 3 and Figure 5, Figure 6 divides time into two decades—the 1990s and the 2000s—and inspects the average of the insurance expenditure to income index over each decade in each state. Growth from the 1990s average to the 2000s average is documented in Figure 6.

Interestingly, the growth in the 10-year average of the insurance expenditure to income ratio shrank in all states except: Michigan (8% growth), Montana (7% growth), Alaska (3% growth), Florida (2% growth), Louisiana (2% growth) and Wyoming (1% growth). With the exception of these six states, insurance became more affordable from the 1990s to the 2000s. The states with the most significant reduction in the insurance expenditure to income ratio were: Hawaii (32% decline), California (23% decline), Connecticut (20% decline), D.C. (20% decline), New Hampshire (20% decline), New Mexico (18% decline) and Massachusetts (18% decline).[10]

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10. It should be noted that these changes could be due to several factors, including changes in the number of uninsured motorists, changes in the injury cost index and changes in the level of competitive (using HHI as a barometer). The impact of these factors on the insurance expenditure to income ratio will be empirically tested later in this study.

Figure 6:
Growth from Decade (1990s) to Decade (2000s) in Average Insurance
Expendiure to Income (Median)
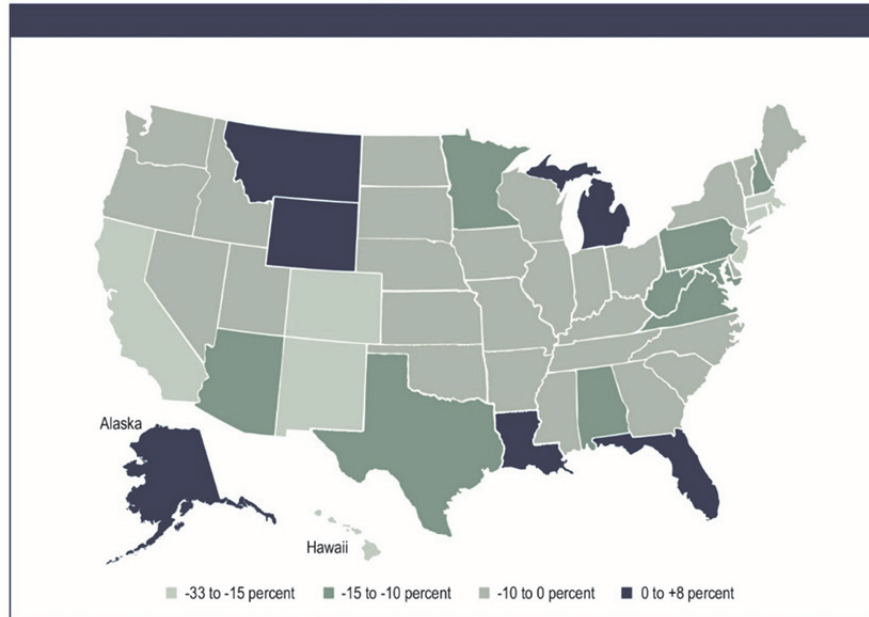
When attention is turned to the most recent decade, additional attention-grabbing findings are revealed. Using the insurance expenditure to income index, an average for the earlier part of the decade (2001–2005) and the latter part of the decade (2006–2010) are created for each state. In Figure 4, the growth rates of each five-year average are compared.

Figure 7 indicates that affordability continued to improve into the late 2000s. In fact, not one state experienced an increase in the average insurance expenditure to income index from the earlier period (2001–2005) to the latter period (2006–2010).

Figure 7:
Growth from 2001–2005 to 2006–2010 in Average Insurance
Expenditure to Income (Median)
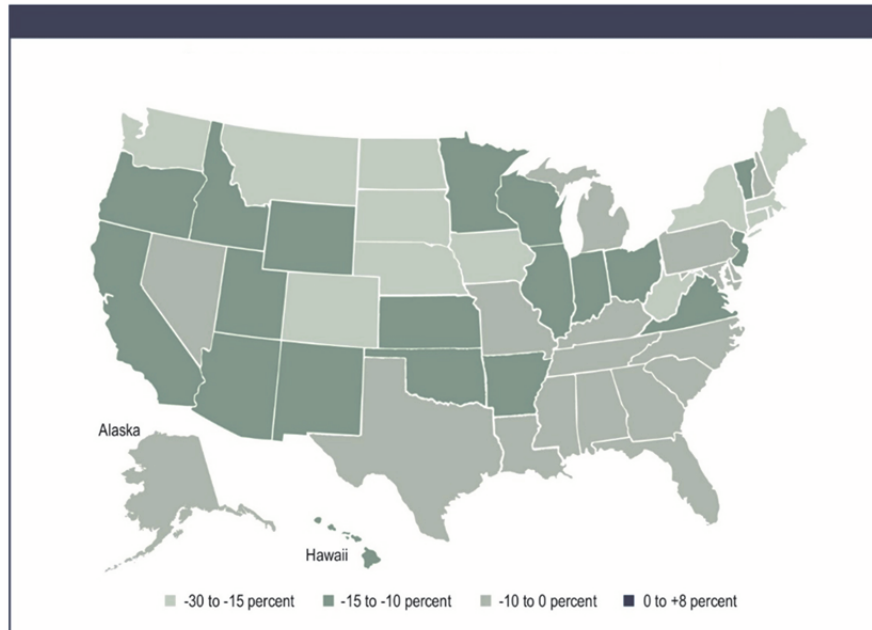
Drivers of Affordability

In the preceding section, it was shown that both national and state insurance affordability improved over the past two decades and into the latter part of the 2000s. It was also shown that the affordability varies across states. In this section, several factors that may be the source of this variation are inspected. These factors include: competition, regulation, government involvement via residual markets, richness or generosity of the injury compensation system, uninsured motorists, and the economy. State data continue to be the focus in this section, as they provide more observations and allow for unique state-by-state comparisons.

Over the timespan inspected below (2002-2010), the overall state average trended down for the average insurance expenditure to income index. This coincided with more competition, slightly less regulatory stringency and less uninsured motorists on average across the states. Residual market size, the injury cost index and the unemployment rate were volatile across the states over the time period. Each of these factors is discussed in detail in the remainder of this section.

Competition

Greater competition has been shown to correlate with lower prices (Thomas, 2013). If this holds true in the automobile insurance industry, it follows that affordability may improve with increased competition. In order to test the relationship, a measure of competition must be established. The Herfindahl-Hirschman Index (HHI) is a widely accepted indicator of competition. The HHI is calculated as the sum of the squared values of each firm's market share. The result is proportional to the average market share, weighted by market share. As such, it can move from 0 (perfect competition) to 10,000 (pure monopoly).

The U.S. Department of Justice (DOJ)/Federal Trade Commission (FTC) guidelines set threshold values for the HHI to distinguish markets with different degrees of competition. Markets are characterized as unconcentrated if the HHI is below 1,000; moderately concentrated if the HHI is between 1,000 and 1,800; and concentrated if the HHI is above 1,800 (Insurance Research Council, Tennyson, 2012). Most DOJ/FTC actions regarding lack of competitiveness take place in concentrated markets—for example, those that have an HHI greater than 1,800 (U.S. Department of Justice and Federal Trade Commission, 2006). The state automobile insurance markets fall in unconcentrated or moderately concentrated range and, therefore, would not raise any concerns about lack of competition.

In order to test the relation between the HHI and auto insurance affordability, each state's average auto insurance expenditure to income ratio and each state's HHI statistic for automobile insurance were calculated. The two variables were then individually averaged from 2002–2010, resulting in an average expenditure to income ratio and an average HHI for each state. The diamonds in Figure 8 represent each state's relationship between the ratio and HHI.

Figure 8, which uses an ordinary least squares regression, shows a clear positive relationship among the states, implying that the higher concentrated states (or states with higher HHIs) are also the states that have a higher average insurance expenditure to income ratio (or states that are less affordable). In other words, insurance rates in states with less competition tend to be less affordable, and insurance rates in states with more competition tend to be more affordable.[11]

It is evident from Figure 8 that the average auto insurance expenditure to income ratio increased for the buckets that were less competitive. In other words, the most competitive bucket (HHI from 600 to 899) includes states with the most affordable auto insurance. Alternatively, the least competitive bucket (HHI from 1200 to 1800) includes states with the least affordable auto insurance.

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11. It should be noted that even the least competitive states still satisfy the DOJ criteria for a competitive markets; the states that have higher HHIs are simply less concentrated or competitive than the other state insurance markets.

Figure 8:
States That Are More Competitive Tend to Be More Affordable
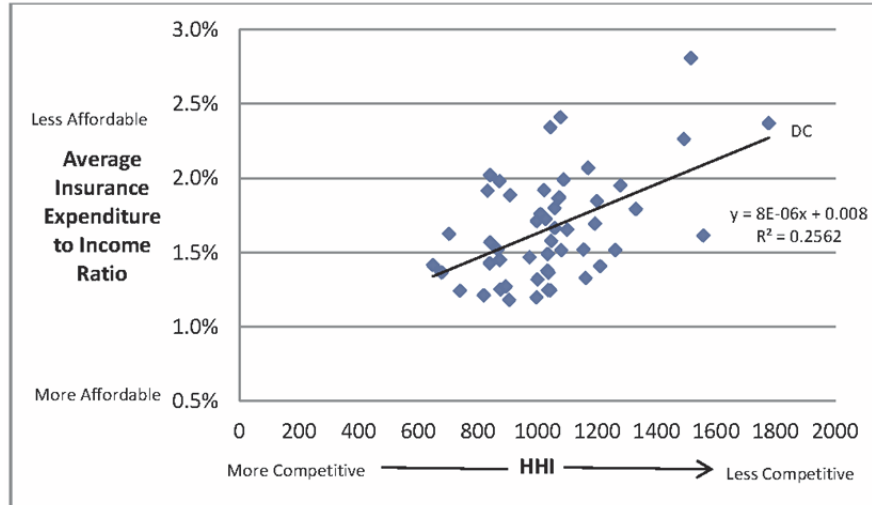
In summary, competition appears to be related to state auto insurance affordability. Despite the fact that, as a whole, the auto insurance industry is considered to be competitive and all states fall into the lower realms of concentration, the relative concentration of a state does appear to be related to that state's auto insurance affordability.

Regulation

Insurance rate regulation is considered by many to be an essential tool used to constrain high auto insurance prices, and numerous states require suppliers of automobile insurance to obtain regulatory approval of their rates. According to Tennyson (2012), "A large body of research has produced a consensus among insurance scholars that automobile insurance markets do not require rate regulation to function efficiently and fairly." The subject has been explored in-depth by several academics.[12] In fact, recent research suggests that automobile insurance markets in which rates are determined competitively perform better on a wide variety of measures than do regulated markets (Tennyson, 2012). The concept was explored further and supported in a recent survey of insurance academics (Tennyson, 2013). This section quantitatively examines the correlation between affordability and regulatory stringency.

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12. Several articles on this subject can be found in the book *Deregulating Property-Liability Insurance: Restoring Competition and Increasing Market Efficiency,* 2002.

Figure 9:
States with Less Stringent Regulatory Laws
Tend to Be More Affordable
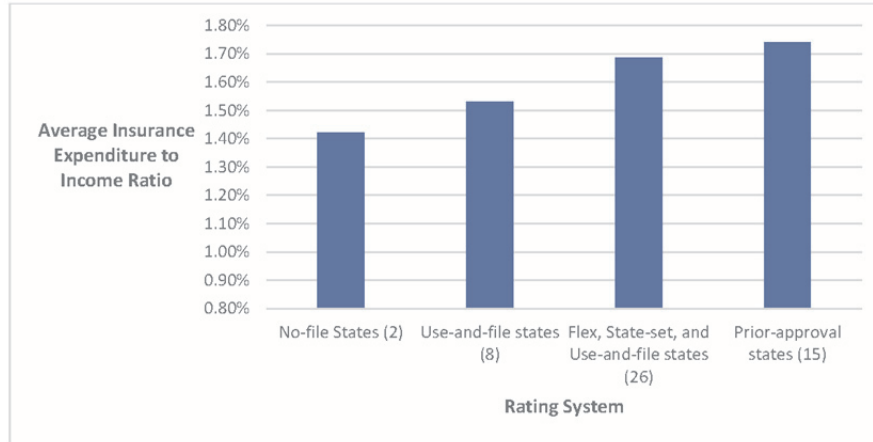
To measure regulatory stringency, information on each state's regulatory environment needs to be obtained. The information on state regulatory laws is obtained from the Insurance Information Institute (I.I.I.). Although most states impose a significant degree of direct control over the rates insurance companies charge, the stringency of laws varies. There are several different types of laws (Hunter, 2008).

First, "prior-approval" laws require regulators to pre-approve all rates. This may be the most stringent of regulatory laws. Second, "state-set" laws, which only existed in Massachusetts and were abolished in 2008 (Derrig, 2010), permitted the state to establish allowable rates (Burnes, 2007).[13] Third, a "file and use" system requires insurers to file their prices with the state prior to use along with a rationale for why the rates should be altered. The company can start using these rates once the paperwork is accepted, but the states can later disapprove of the rates. A fourth system is the "flex-rating" system, which allows companies to charge rates within a certain range without any specific rate filing. Above that range, however, prior approval of a rate change is necessary. The fifth system is the "use-and-file" system, which is used by several states. These systems grant insurers a degree of freedom in setting rates but still require insurers to inform state authorities of the rates. Finally, "no file" systems, which are used in two states (Illinois and Wyoming), require states to charge actuarially adequate rates and not charge unconscionable rates. With this system, no review or filing of rates is necessary.

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13. Some may argue that these laws could rival prior-approval in terms of stringency. However, since 2008, Massachusetts, the lone state setting-state, has moved to a system of managed competition.

To rank these alternatives by stringency, four buckets were created. The first bucket, or most stringent bucket, consists of states with prior-approval rate laws. The second bucket, or second most stringent bucket, consists of a few systems: the state-set system,[14] the file–and-use system and the flex system. Each of these systems are often cited in research as less stringent than prior-approval, but more stringent than use-and-file and no-file systems (Lehrer, 2009). The third bucket, or second least stringent bucket, consists of use-and-file states. Lastly, the least stringent bucket consists of the no-file states. Figure 9 presents the average of each bucket's insurance expenditure to income ratio.

Figure 9 shows that states with more stringent regulatory laws tend to be relatively less affordable. This is an interesting finding in that one of the rationales behind prior-approval rate regulatory systems is to ensure that prices are not excessive (Weiss, 2010; Weiss, 2008; Grace, 2002).

Residual Markets

Availability of insurance should be an important variable in a study of insurance affordability. A common measure of the availability of insurance is the percentage of cars insured through a state's "involuntary" residual insurance market. Larger percentages of drivers in a state's residual market may suggest that insurers are unwilling to insure some drivers at the premium levels established by the "voluntary" market (Harrington, 2002; Bouzouita, 1997). These residual markets increase in size if regulation suppresses rates below a level that allows insurers to earn a competitive return.[15] Therefore, the percentage of cars in the residual markets could also be viewed as a proxy for government involvement in the market.

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14. Massachusetts individually averages an insurance expenditure to income ratio of 1.79%, which is the highest of all buckets. However, it was included in a less stringent bucket because the state system moved away from the state-set system within the 2002–2010 time frame. If Massachusetts was excluded from the "second most stringent bucket," there would be very little change to the second bucket expenditure to income average, remaining at 1.68%.

15. This can occur when rates are suppressed below their equilibrium level. In such cases, a shortage develops and because the voluntary market cannot or is unwilling to insure as many individuals, the quantity demanded for coverage within the residual market grows.

Figure 10:
States with the Smallest Residual Markets Tend to be More Affordable
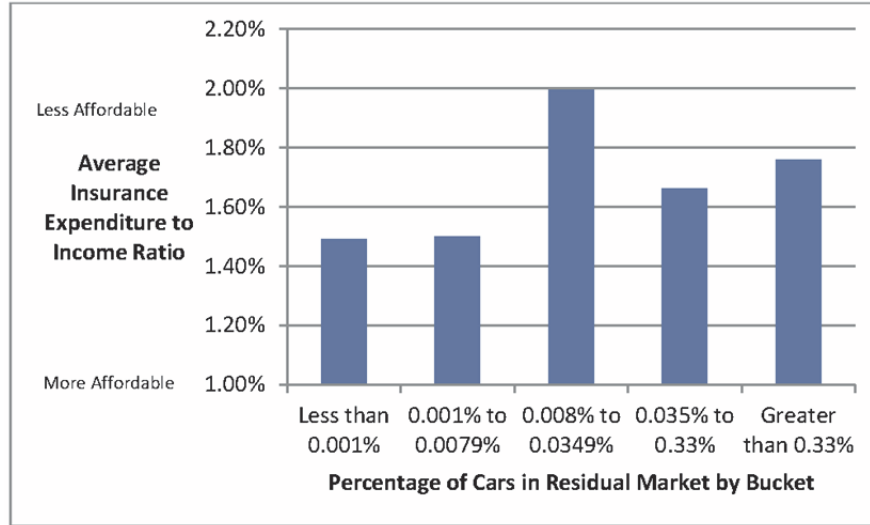
Data was gathered on the percentage of cars in the residual market from the Automobile Insurance Plan Service Office (AIPSO).[16] Once the data were gathered for each state, a state average of the percentage of cars in the residual market from 2002–2009 was calculated. Five buckets were established to describe the relative size of state residual markets, with each bucket holding 10 states. The first bucket consisted of states with a residual market lower than 0.001% . The second bucket consisted of states with a residual market between 0.001% and 0.0079%. The third bucket consisted of states with a residual market between 0.008% and 0.0349%. The fourth bucket consisted of states with a residual market between .035% and 0.33%, and the final bucket consisted of states with a residual market greater than 0.33%. Within each of the five buckets, the state average insurance expenditure to income ratio was also computed. In Figures 10 and 11, the percentage of cars in the residual market buckets is compared to the average insurance expenditure to income ratio.

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16. The last data point available was 2009.

Figure 11:
Outlier Involved in Residual Market to Affordability Comparison
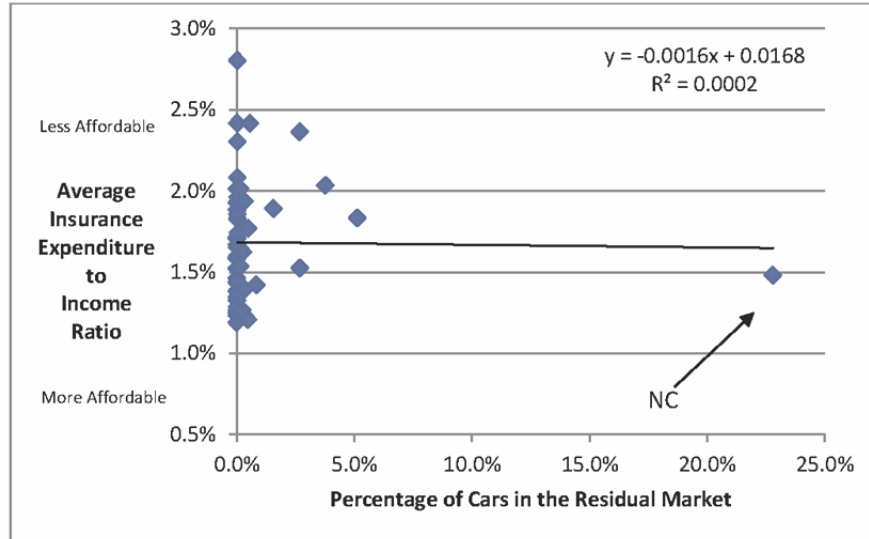
With the exception of states that fell between 0.0079% and 0.035% residual market size, the chart shows that states with larger percentages of cars in the residual market tend to have less affordable insurance. Of course, the counter is that states with fewer cars in the residual market tend to be more affordable. The exception is the bucket that contains between 0.0079% and 0.035% of cars in the residual market; this bucket has the worst performance in terms of affordability.[17]

Richness of the System

Auto injury compensation costs may also influence a state's insurance affordability if these costs are inflated in some way. In order for insurers to stay viable, they need to offset rising costs and, if permitted, may do so through premium increases. However, a variable that solely tracks a state's auto injury compensation is not a good relative measure. Instead, a measure of how much the system rewards injuries relative to an alternative liability is sought after. This sort of variable would capture the relative generosity of a particular state's legislative or judicial system towards auto injury claims.

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17. After inspecting several states involved, it is believed that the Florida, Louisiana, Mississippi and West Virginia markets heavily bias the affordability calculations for this bucket. If these states are removed, the average insurance expenditure to income ratio falls below 1.5%.

Figure 12:
States with Lower Injury Costs Tend to Be More Affordable
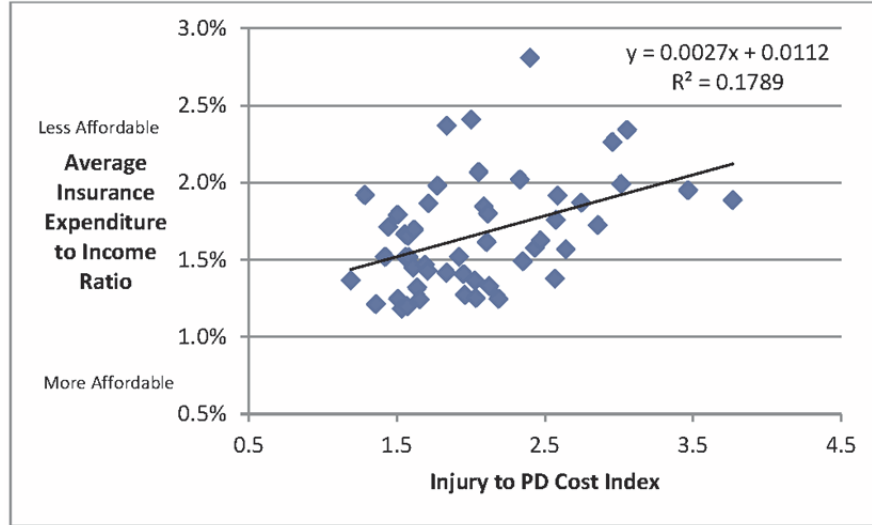
Fortunately, the Insurance Research Council (IRC) calculates such an index in the *Trends in Auto Injury Claims* report (Insurance Research Council, 2011). The insurance cost index measures insurance dollars paid for auto injury compensation per insurance dollar paid for property damage (PD) liability claims; it is the ratio of combined injury loss costs to PD liability loss costs. Auto injury compensation costs are influenced by factors beyond state auto insurance laws and benefits levels, such as a state's inflation rate, population density and demographics. Because these factors affect both injury and PD loss costs, the injury cost index cancels them out. The result is an indicator that supports state comparisons as well as trends across time. The injury cost index is a convenient way to compare the "richness" of state compensation systems, but it also controls for other factors that could influence combined injury loss costs.

To compare the index and draw some conclusions regarding its correlation with affordability, the injury to PD cost index is first averaged from 2002 to 2008 for each state.[18] The resulting state averages are then compared with each state's average insurance expenditure to income ratio. Figure 12 presents the findings.

Figure 12 reveals that states with higher injury to PD costs indices tend to be less affordable. This means that states that have more generous legislative or judicial systems in regard to auto injury claims tend to be less affordable for consumers. The opposite, of course, holds true as well. States with lower injury to PD costs indices, which means they have less generous legislative or judicial systems in regard to auto injury claims, tend to be more affordable for consumers.

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18. The last historical data point for the injury to PD cost index is 2008.

Figure 13:
States with Less Uninsured Motorists Tend to Be More Affordable
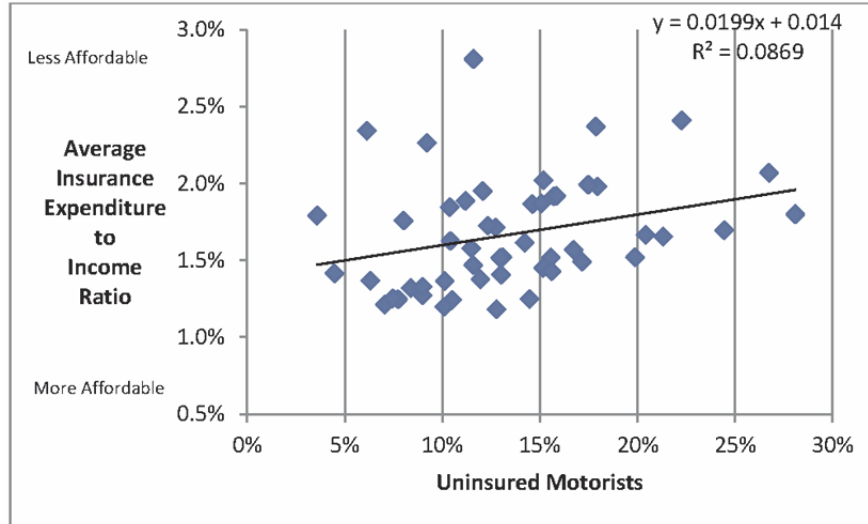
Uninsured Motorists

The uninsured motorist (UM) problem is another pivotal issue for insurers, regulators and policyholders. For insurers, additional resources for tasks such as underwriting UM coverage and processing UM claims are required to comply with regulatory requirements relating to uninsured drivers. Policy makers and regulators have attempted to address the issue, but new laws and regulations require resources to be enacted and enforced. Insured drivers are forced not only to cover their own actions, but also pay a portion of the costs for those who drive without insurance. Indeed, because UMs create additional risk and are the catalyst for universal UM coverage, insured motorists pay higher premiums.

Since it has been well documented that higher UM rates lead to higher premiums (e.g. Calvin, 1956; Ma, 2000), a motive exists to study the variable's association with affordability. To study the relationship, UM data are needed. An estimate for UM was created by comparing the injury portion of UM coverage with bodily injury (BI) liability coverage. The ratio of UM claim frequency to BI claim frequency provides an estimate of the percentage of uninsured drivers, as well as the percentage chance that an injury-causing accident was the fault of an uninsured driver. The IRC's UM to BI claim frequency ratio was collected for each state and averaged from 2002–2009.[19] The average over that time span was compared to the average expenditure to income ratio for each state in Figure 13.

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19. The last historical data point for the UM to BI index is 2009.

Figure 14:
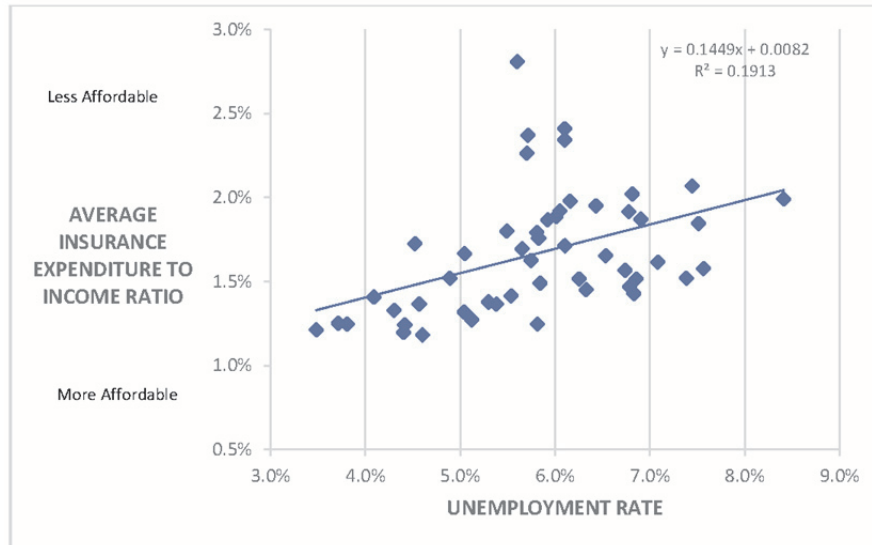**States with Lower Unemployment Rates Tend to Be More Affordable**

States with lower UM rates tend to be more affordable, although the correlation is not strong. As such, this provides some evidence of a relationship between the percentage of uninsured within a state and that state's relative affordability.

The Economy

Considering the aforementioned index includes income in the denominator, it is fairly clear that the economy may also affect insurance affordability. The statistic on which this research focuses is the unemployment rate, which can affect affordability, defined as average insurance expenditures over income, in several ways. First, states with higher levels of unemployment may also have more uninsured motorists, which could increase the amount that insureds pay for UM coverage and lead to higher insurance expenditures. Second, a weaker economy, seen in a higher state unemployment rate, may mean weaker relative state incomes. A decline in incomes, which is the denominator in the insurance expenditure to income ratio, would push the index up and imply weaker affordability. All told, unemployment may affect expenditures (numerator) and incomes (denominator) and, therefore, sway the average insurance expenditure to income ratio.

To measure the correlation between the unemployment rate and the average insurance expenditure to income index, state unemployment rate data were collected from the Bureau of Labor Statistics (BLS). Each state's unemployment rate was averaged from 2002 through 2010. In Figure 14, the average unemployment rate for each state is compared to its average insurance expenditure to income ratio.

Figure 13 shows that there is a direct relationship between the unemployment rate and the average insurance expenditure to income ratio. This implies that states with higher unemployment rates tend to have less affordable automobile insurance environments. Alternatively, states with lower unemployment rates tend to be more affordable.

Modeling Affordability

In the preceding section, several variables were shown to be correlated with the average insurance expenditure to income index. These variables included the HHI in the state's insurance industry, the state's rate regulatory system, the percentage of cars in the state's residual market, the state's injury to PD cost index, the state's percentage of uninsured motorists and the state's unemployment rate. In this section, a model for insurance affordability is created using the aforementioned variables. The model's purpose is to measure the relative importance and significance of each variable.

Because the data range across states and over time, the ideal model would use panel least squares regression.[20] Unfortunately, one of the aforementioned variables—the state's regulatory system—did not change enough over time to measure within this statistical framework. In fact, the heavy majority of states did not change their regulatory systems at all over the studied range from 2002 to 2008.[21][22] Therefore, although it has already been shown that the regulatory system variable is associated with affordability, it cannot be included in the panel analysis. Because of that, the regulatory system's importance compared to the other variables will remain somewhat unknown.

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20. Panel data analysis is a method of studying a particular subject within multiple sites, periodically observed over a defined time frame. The state fixed-effect approach, which controls for omitted and unobserved effects that are different across states yet stable over time, is used in our estimations.

21. Although some variables had a longer data history, 2008 needs to be the end of the data set in order for all variables to exist in an equitable manner within the panel data setup.

22. Previous research has shown a very strong relationship between stricter rate regulation and residual market size (e.g. Bouzouita, 1997). This indicates that residual market size may also be measuring the effects of rate regulation.

With the regulatory system variable dropped, the panel model is left with five independent variables. Equation 2 below specifies the model:

(Equation 2) $R_{it} = \propto_i + a_1 H_{it} + a_2 M_{it} + a_3 C_{it} + a_4 U_{it} + J_{it} + e_{it}$

- Where R_{it} is the state i's average insurance to expenditure index at time t
- Where $\propto_i$ (i=1…n) is the unknown intercept for each entity (n-entity specific intercepts)
- Where H_{it} is the state i's HHI at time t
- Where M_{it} is the state i's percentage of cars in residual market at time t
- Where C_{it} is the state i's injury to PD cost index at time t
- Where U_{it} is the state i's % of uninsured motorists at time t
- Where J_{it} is the state i's unemployment rate at time t
- Where e_{it} is the state i's error term at time t

To recap, the hypothesis is that the dependent variable, R_{it}, will be positively correlated with all five independent variables.[23] The panel least squares estimation results are summarized in Table 1.

The estimation results show that four of the five variables are directly related to the dependent variable, which supports the initial hypothesis regarding a positive relationship at the 1% level. Interestingly, the regression coefficients are largest in magnitude for the residual markets[24] and unemployment rate variables, implying that minor changes in these variables can cause relatively larger swings in affordability. Although the coefficient is quite small for the HHI variable, this variable had the highest statistical significance.[25]

Overall, the R^2 statistic shows that the model explains roughly 91% of the variation in average insurance expenditure to income from 2002–2008. This is a strong indicator of the reliability of the model to predict future outcomes provided current relationships remain stable in the future (Steel, 1960).

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23. A correlation matrix was developed and tested for all variables. The results showed that no independent variables were highly correlated. No two variables are correlated at above 0.3.

24. It should be noted that the high coefficient for residual market size may be due to North Carolina acting as an outlier and driving the results. To ensure that North Carolina was not driving the results observed, the analysis was repeated with North Carolina excluded. The results were similar. The residual market size variable coefficient decreased slightly to 0.13. All other variables coefficients increased slightly, the statistical significance did not change for any variable, and the model's R-squared remained at 0.91.

25. Also, it should be noted that the HHI range is much greater than all other variable ranges, and the smaller coefficient may be due to that.

Table 1:
Panel Least Squares Estimation Results

Panel Regression Results	
Data ranged across states from 2002–2008	
Dependent Variable:	***Estimation Results:***
Average insurance expenditures to income (median) ratio	*Coefficient*
Independent Variables:	*(std. error)*
HHI (measure of competition)	0.00000057 *** (0.00000018)
Residual markets (measure of government intervention)	0.140 *** (0.0172)
Injury to PD cost index (measure of richness of system)	0.001 *** (0.0003)
Uninsured motorists (measure of market health)	0.005 (0.004)
Unemployment rate (measure of economic health)	0.052 *** (0.011)
R-square (within)	0.91
Number of observations	357
*** = significant at .01 level, ** = significant at .05 level, * = significant at .1 level	

To summarize, the panel model indicates that four out of the five variables are statistically significant in relation to the insurance expenditure to income ratio. Each variable had a positive relationship, meaning that the larger the variable (HHI, residual markets, injury to cost index or the unemployment rate), the worse off the average consumer would be in terms of affordability. The variable that had the largest effect was the residual market variable, which indicated that a one-unit increase in that variable corresponded to a 14% increase in the average insurance expenditure to income ratio.

Conclusion

As the struggling economy continues to weigh on the less fortunate, automobile insurance affordability has received increasing scrutiny from consumer groups, regulators and policy makers. Insurers are being asked how they are attempting to solve the problem and improve auto insurance affordability. Still, there is little evidence that auto insurance is becoming less affordable for the poor or middle class. The lack of evidence may be because there is no definitive, universally accepted measurement of auto insurance affordability.

In this report, a methodology to empirically study auto insurance affordability using existing data was created. An average auto expenditure to median income index provided an inverse measurement to study auto insurance affordability. As the index increased, affordability was thought to decrease and, as the index decreased, affordability was thought to increase. Although the expenditure data were averaged, it was possible to break down the income data into quintiles. Therefore, the average auto insurance expenditure to low-income index was also analyzed.

The findings show that national auto insurance affordability has improved for those of moderate incomes and low incomes over the past decade. In fact, the median income and low income average indices improved by 9% from the 1990s to the 2000s. Interestingly, the improvement also continued for both income groupings into the late 2000s, when the available auto insurance expenditure data history came to an end. The findings also show that state auto insurance affordability improved from the 1990s to the 2000s in all but six states. From the early 2000s to late 2000s, auto insurance affordability continued to improve for every state.

Using this methodology to gauge auto insurance affordability, it was evident that affordability has been improving, not getting worse. The next step was to posit what factors may be driving the improvement. Several factors were inspected, including a measure of competition (HHI); a measure of regulation (rate system); a measure of government involvement (percentage of cars in residual market); a measure of richness of the system (injury to PD index); a measure of market health (percentage of uninsured motorists); and a measure of the economy (the unemployment rate). Each of these factors were found to be associated with the average insurance expenditure to income index, implying that improving these areas may be the trigger to altering the affordability environment.

Finally, each measurable variable (the regulatory rate system was not studied because it did not vary much over time) was placed into a multivariate model and regressed in order to see which variables mattered most across states and over time. It was found that the residual market size and the unemployment rate mattered most in terms of magnitude, while the competitive market framework or market concentration (HHI) was the highest in terms of statistical significance.

Appendix

State	Decade	Median Household Income	Average Auto Insurance Expenditure	Expenditure to Income Ratio	Change in Ratio from 1990s to 2000s
Alabama	1990s Average	$29,860.50	$559.00	1.89%	
Alabama	2000s Average	$38,934.99	$658.23	1.70%	-10.2%
Alaska	1990s Average	$47,437.40	$730.97	1.55%	
Alaska	2000s Average	$57,577.93	$915.31	1.60%	3.3%
Arizona	1990s Average	$33,100.60	$747.47	2.27%	
Arizona	2000s Average	$44,611.58	$877.24	1.97%	-12.9%
Arkansas	1990s Average	$26,206.40	$519.06	1.97%	
Arkansas	2000s Average	$36,193.29	$670.77	1.87%	-5.4%
California	1990s Average	$38,486.50	$754.82	1.99%	
California	2000s Average	$52,345.98	$791.62	1.52%	-23.9%
Colorado	1990s Average	$40,420.90	$716.96	1.80%	
Colorado	2000s Average	$54,291.01	$805.29	1.51%	-16.2%
Connecticut	1990s Average	$43,722.80	$882.99	2.04%	
Connecticut	2000s Average	$59,571.02	$966.37	1.63%	-19.7%
Delaware	1990s Average	$39,592.10	$794.94	2.03%	
Delaware	2000s Average	$51,261.24	$987.26	1.93%	-5.0%
D.C.	1990s Average	$32,545.10	$955.04	2.96%	
D.C.	2000s Average	$47,864.63	$1,124.96	2.38%	-19.7%

Appendix

State	Decade	Median Household Income	Average Auto Insurance Expenditure	Expenditure to Income Ratio	Change in Ratio from 1990s to 2000s
Florida	1990s Average	$31,488.20	$733.33	2.35%	
Florida	2000s Average	$42,296.60	$1,013.71	2.40%	2.4%
Georgia	1990s Average	$34,238.80	$605.62	1.78%	
Georgia	2000s Average	$44,653.24	$760.18	1.71%	-4.1%
Hawaii	1990s Average	$42,671.00	$879.68	2.08%	
Hawaii	2000s Average	$56,360.50	$793.76	1.42%	-32.0%
Idaho	1990s Average	$32,724.60	$454.55	1.39%	
Idaho	2000s Average	$44,350.79	$565.08	1.28%	-8.0%
Illinois	1990s Average	$38,585.30	$611.49	1.60%	
Illinois	2000s Average	$48,653.79	$732.02	1.51%	-5.5%
Indiana	1990s Average	$34,180.70	$539.06	1.60%	
Indiana	2000s Average	$43,844.16	$636.82	1.46%	-8.9%
Iowa	1990s Average	$34,065.70	$429.17	1.27%	
Iowa	2000s Average	$46,021.29	$542.86	1.19%	-6.2%
Kansas	1990s Average	$33,224.80	$473.97	1.43%	
Kansas	2000s Average	$44,405.53	$604.31	1.36%	-4.6%
Kentucky	1990s Average	$30,015.00	$551.75	1.86%	
Kentucky	2000s Average	$38,829.75	$715.93	1.85%	-0.2%

Appendix

State	Decade	Median Household Income	Average Auto Insurance Expenditure	Expenditure to Income Ratio	Change in Ratio from 1990s to 2000s
Louisiana	1990s Average	$28,930.40	$780.06	2.71%	
Louisiana	2000s Average	$37,659.94	$1,043.55	2.78%	2.6%
Maine	1990s Average	$32,833.30	$485.37	1.49%	
Maine	2000s Average	$43,202.61	$608.48	1.42%	-4.7%
Maryland	1990s Average	$44,176.70	$735.64	1.69%	
Maryland	2000s Average	$60,126.19	$907.84	1.51%	-10.3%
Massachusetts	1990s Average	$40,283.10	$870.56	2.17%	
Massachusetts	2000s Average	$55,551.90	$987.46	1.79%	-17.5%
Michigan	1990s Average	$38,014.50	$683.29	1.82%	
Michigan	2000s Average	$46,104.83	$899.04	1.96%	7.6%
Minnesota	1990s Average	$39,848.90	$632.86	1.62%	
Minnesota	2000s Average	$54,805.06	$755.26	1.38%	-15.0%
Mississippi	1990s Average	$26,524.70	$588.96	2.25%	
Mississippi	2000s Average	$34,309.63	$708.60	2.07%	-7.9%
Missouri	1990s Average	$34,648.30	$564.27	1.65%	
Missouri	2000s Average	$44,420.78	$672.65	1.52%	-8.1%
Montana	1990s Average	$28,649.80	$465.40	1.62%	

Appendix

State	Decade	Median Household Income	Average Auto Insurance Expenditure	Expenditure to Income Ratio	Change in Ratio from 1990s to 2000s
Nebraska	1990s Average	$34,082.30	$454.34	1.33%	
Nebraska	2000s Average	$47,223.59	$586.23	1.25%	-6.0%
Nevada	1990s Average	$37,698.30	$768.98	2.04%	
Nevada	2000s Average	$49,467.60	$943.33	1.91%	-6.5%
New Hampshire	1990s Average	$41,019.20	$632.45	1.56%	
New Hampshire	2000s Average	$60,250.38	$748.20	1.25%	-19.6%
New Jersey	1990s Average	$45,120.70	$1,012.84	2.25%	
New Jersey	2000s Average	$60,264.48	$1,134.58	1.90%	-15.8%
New Mexico	1990s Average	$28,643.60	$627.88	2.21%	
New Mexico	2000s Average	$39,735.73	$716.73	1.82%	-17.5%
New York	1990s Average	$34,880.40	$890.88	2.56%	
New York	2000s Average	$46,631.70	$1,088.82	2.35%	-8.3%
North Carolina	1990s Average	$32,838.70	$505.24	1.54%	
North Carolina	2000s Average	$40,622.65	$594.91	1.47%	-4.7%
North Dakota	1990s Average	$30,043.00	$398.25	1.32%	
North Dakota	2000s Average	$43,277.82	$524.01	1.23%	-6.9%
Ohio	1990s Average	$35,085.50	$540.15	1.55%	
Ohio	2000s Average	$44,894.46	$641.14	1.43%	-7.5%

Appendix

State	Decade	Median Household Income	Average Auto Insurance Expenditure	Expenditure to Income Ratio	Change in Ratio from 1990s to 2000s
Oklahoma	1990s Average	$28,793.80	$523.42	1.82%	
Oklahoma	2000s Average	$40,237.44	$666.89	1.67%	-8.2%
Oregon	1990s Average	$35,800.90	$583.92	1.64%	
Oregon	2000s Average	$45,861.99	$717.41	1.58%	-4.0%
Pennsylvania	1990s Average	$34,919.90	$674.00	1.94%	
Pennsylvania	2000s Average	$46,413.80	$810.03	1.75%	-10.0%
Rhode Island	1990s Average	$34,471.50	$817.63	2.39%	
Rhode Island	2000s Average	$48,528.80	$974.41	2.02%	-15.6%
South Carolina	1990s Average	$34,039.80	$635.14	1.88%	
South Carolina	2000s Average	$40,173.27	$734.36	1.83%	-2.7%
South Dakota	1990s Average	$30,225.50	$419.40	1.39%	
South Dakota	2000s Average	$43,594.75	$542.22	1.26%	-9.4%
Tennessee	1990s Average	$29,766.20	$535.44	1.81%	
Tennessee	2000s Average	$38,851.27	$643.68	1.66%	-8.4%
Texas	1990s Average	$32,843.40	$691.98	2.13%	
Texas	2000s Average	$43,369.00	$824.50	1.91%	-10.3%
Utah	1990s Average	$38,796.10	$554.63	1.44%	
Utah	2000s Average	$53,604.80	$704.48	1.32%	-8.1%

Appendix

State	Decade	Median Household Income	Average Auto Insurance Expenditure	Expenditure to Income Ratio	Change in Ratio from 1990s to 2000s
Vermont	1990s Average	$35,056.20	$516.53	1.48%	
Vermont	2000s Average	$48,340.99	$660.59	1.38%	-7.1%
Virginia	1990s Average	$40,301.50	$540.57	1.35%	
Virginia	2000s Average	$55,684.29	$664.26	1.20%	-11.0%
Washington	1990s Average	$38,928.30	$656.98	1.70%	
Washington	2000s Average	$52,173.75	$820.64	1.59%	-6.7%
West Virginia	1990s Average	$25,243.00	$638.92	2.54%	
West Virginia	2000s Average	$36,338.37	$815.96	2.28%	-10.4%
Wisconsin	1990s Average	$38,422.80	$518.72	1.36%	
Wisconsin	2000s Average	$48,365.68	$601.37	1.25%	-8.5%
Wyoming	1990s Average	$32,987.30	$436.08	1.32%	
Wyoming	2000s Average	$46,594.45	$614.81	1.33%	0.6%

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Guidelines for Authors

Submissions should relate to the regulation of insurance. They may include empirical work, theory, and institutional or policy analysis. We seek papers that advance research or analytical techniques, particularly papers that make new research more understandable to regulators.

Submissions must be original work and not being considered for publication elsewhere; papers from presentations should note the meeting. Discussion, opinions, and controversial matters are welcome, provided the paper clearly documents the sources of information and distinguishes opinions or judgment from empirical or factual information. The paper should recognize contrary views, rebuttals, and opposing positions.

References to published literature should be inserted into the text using the "author, date" format. Examples are: (1) "Manders et al. (1994) have shown. . ." and (2) "Interstate compacts have been researched extensively (Manders et al., 1994)." Cited literature should be shown in a "References" section, containing an alphabetical list of authors as shown below.

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