"STICKER SHOCK" IN INDIVIDUAL INSURANCE UNDER HEALTH REFORM

Mark Pauly
Scott Harrington
Adam Leive

ABSTRACT

This paper provides estimates of the changes in premiums, average or expected out of pocket payments, and the sum of premiums and out of pocket payments (total expected price) for a sample of consumers who bought individual insurance in 2010 to 2012, comparing total expected prices before the Affordable Care Act with estimates of total expected prices if they were to purchase silver or bronze coverage after reform, before the effects of any premium subsidies. We provide comparisons for purchasers of self only coverage in California and in 23 states with minimal prior state premium regulation before the ACA now using federally managed exchanges. Using data from the Current Population Survey, we find that the average prices increased by 14 to 28 percent, with similar changes in California and the federal exchange states; we attribute the increase primarily to higher premiums in exchanges associated with insurer expectations of a higher risk population being enrolled. The increase in total expected price is similar for age-gender population subgroups except for a larger than average increases for older women. A welfare calculation of the change in risk premium associated with moving from coverage that prevailed before reform to bronze or silver coverage finds small changes.

Mark Pauly
Health Care Management Department
The Wharton School
University of Pennsylvania
208 Colonial Penn Center
3641 Locust Walk
Philadelphia, PA 19104-6218
and NBER
pauly@wharton.upenn.edu

Adam Leive
Health Care Management Department
The Wharton School
University of Pennsylvania
204 Colonial Penn Center
3641 Locust Walk
Philadelphia, PA 19104
leive@wharton.upenn.edu

Scott Harrington
Wharton School
University of Pennsylvania
206 Colonial Penn Center
3641 Locust Walk
Philadelphia, PA 19014-6218
harring@wharton.upenn.edu

An online appendix is available at:
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I. Introduction

A major part of the "Affordable Care Act" (ACA) is a change in the market for insurance non-elderly people buy as individuals, using a combination of new subsidies and new federal regulatory rules. The reason for focus on this market is not its pre-ACA quantitative importance—while "millions" bought coverage in this way, it covered only 5% of the under-65 population—but rather because it is to be the vehicle by which the bulk of the currently uninsured will obtain insurance. That insurance will discharge their obligation to have coverage under the individual mandate. Moreover, the only channel for obtaining federal tax credit subsidies for insurance purchase in the individual market is through the exchanges or marketplaces.

Although some of the ACA's changes can be interpreted as efforts to improve the apparently low efficiency, broadly defined, of this part of the insurance market (compared to group health insurance), they also are intended to achieve social goals of improved health and equity in health and financial outcomes across potential insurance buyers by age, sex, income, and indicators of risk. While we have raised questions about both the appropriateness of these broad goals and about whether the ACA's provisions achieve them in the most efficient way (Pauly, 2010; Harrington, 2009), in this paper our main objective is to assemble information that answers the question of whether the "price" (yet to be defined and before any premium subsidies) of health insurance and health care for people who previously used the individual market is affected by the way these changes are being implemented, and on whether (compared to the starting point) there would be an improvement in welfare without considering the effects of premium subsidies. This pre-subsidy price analysis is relevant for the majority of previous buyers who are eligible for little or no subsidy and for providing insight into the effects of the law on the overall cost of coverage, including the direct cost of premium subsidies. We use data from California and from 23 states that will have federally run exchanges and which had minimal prior state insurance

premium regulation. We chose California because of its population size and because its new and aggressive program stimulated the most initial interest. Then we look at the larger population using federal exchanges as a larger sample which should be reasonably homogeneous in terms of prior regulation and in terms of exchange procedures and operations.

Specifically, we are interested in whether changes due to the ACA impact the price and financial circumstances (averaged over some relevant population) for individuals obtaining ACA-compliant insurance on exchanges (compared to levels paid before reform), and whether there are significant price changes around this average for different identifiable population subgroups. We also explore how these changes in average financial outcomes correspond to changes in welfare for risk averse individuals, using benchmark external parameters for risk aversion. Another potential adjustment to provide an accurate measure of welfare change would be to adjust for premium changes due to moral hazard. However, as will be shown, the change in average levels of coverage for former purchasers from prior coverage to the bronze and silver plan benchmarks we explore is modest. We therefore only comment on moral hazard effects but do not provide estimates of incremental welfare effects.

We first show that there are serious challenges and limitations in scope to previous attempts to make before-and-after "sticker shock" comparisons using only premium data (of whatever quality). In addition to imperfect data on posted or estimated premiums in the pre-ACA period, precise measures of the generosity and form of coverage are also lacking, leading to an "apples to oranges" comparison problem with specific plans to be offered on exchanges. Obviously, the quoted premium for a very high deductible catastrophic policy will be lower than that for a very comprehensive policy with minimal cost sharing. While compelling some people to buy more comprehensive coverage than they would choose voluntarily would necessarily cause them to pay higher premiums, any analysis of the change in premiums should at least recognize that more comprehensive coverage pays for more medical costs,

even if the change in the generosity of coverage purchased turns out to be modest. Our suggested measure does that, albeit imperfectly.

Specifically, we propose that a relevant measure of price experienced on average (or in an expectations sense) by a buyer of insurance facing a risk of medical care spending is not just the insurance premium per se but also the expected amount of out of pocket payments (given whatever insurance coverage that premium buys).   Moreover, measures of volume of insurance purchases at a given premium are important for an evaluation, and are generally lacking in other studies. It is relatively inexpensive to file a premium for a given plan but many plans with posted premiums are purchased by few people— because of (pre-ACA) underwriting procedures, marketing differences, undesirable cost-sharing provisions, and consumer perceptions. There is not much point in considering a premium (or a pattern of coverage) no one buys. Our approach therefore tries to focus on a "transactions price" measure of price (rather than posted or quoted prices). In doing so, we focus on the change in "price" to consumers who previously bought individual insurance. Our proposed measure provides a summary measure of the average impact of price and coverage changes for actual transactions undertaken by a representative sample of former individual insurance purchasers.

The other key issue is the relevant measure of "price" after ACA implementation, since the program does not lead to a unique premium, coverage mix, or set of purchasers. Before the ACA, private health insurance websites offered listings of multiple insurance options and their premiums. However, the premium posted on a website was not necessarily the premium a buyer would be charged, even after the buyer provided information on age, gender, location, and smoking status. This is because private insurance was medically underwritten, so premiums were lower for the good risk majority than for the high risk minority. Because of risk rating and because illness lowers disposable income it is likely that the part of the population which purchased risk-rated health insurance from private firms was lower risk

on average than the full population of potential buyers on the new exchanges. We do not know what assumptions firms bidding on exchanges made about the risk level of the population they would attract. They will be selling both to former purchasers and the formerly uninsured at a uniform price, and there is some speculation that the formerly uninsured population was lower risk relative to the risk level in the former population of purchasers (CBO, 2009).   While it is likely that because of the post-ACA prohibition on underwriting (for anything but smoking) and guaranteed issue means that insurers priced coverage in expectation of attracting a higher risk population for any age-sex demographic, the uninsured population tended to be younger than the population of individual insurance purchasers (or of all private insurance purchasers). No one knows what insurers anticipated in terms of the resulting risk mix that would ultimately enroll. One possibility is a healthier or lower utilizing population. But another is that the population of previous buyers as a whole will experience an increase in premiums for each level of coverage and therefore modestly higher premiums and total spending. [1] Our results will shed light on the question of anticipated change in the mix of risks.

We find that the overall effect of reform on prices paid by previous individual insurance purchasers, before taking subsidies into account, is not as large as many of the estimates from opponents of the ACA, but is very likely to represent a moderate increase on average if former buyers choose the lowest premium options in exchanges. Some population subgroups pay higher incremental prices than this average.

Our data are necessarily imperfect, so we provide an analysis that compares key measures in our data with other data sets and estimates. We show that in important dimensions our data does seem

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[1] We collected data on premium quotes and benefit design in 2013 from healthcare.gov in an effort to characterize pre-ACA coverage levels, but the dual challenges of accounting for underwriting and measuring the volume of transactions led us to focus on survey-based measures of insurance coverage to measure prices in the pre-ACA period. A report by the Society of Actuaries (2013) uses survey based measures of coverage and utilization to project higher average costs per insured in the individual market post-ACA due to an assumed increased utilization of medical care by the previously uninsured and gravitation of persons previously insured in state or federal high risk plans into the exchanges.

consistent with other estimates, and we offer sensitivity analyses of the consequences of possible errors in measurement relative to the unknown truth.

II. The Policy Question: What Might We Mean by a Price Change for Insurance?

Insurance, in economics, is not a commodity with a price and a quantity. Instead, the premium per time period reflects total spending for dollars to be delivered in states specified in the policy; it is analogous to a measure of total spending (price times quantity) per buyer. Hence one needs to look both at the premium relative to the expected financial benefits (and any other managed care limits) associated with the policy it buys.

The most common summary measure of this price-like concept is the "loading," the difference between premium and benefits, usually calculated as a percentage of either the premium or average (expected) benefit (Phelps, 2010). Ehrlich and Becker's model of insurance purchasing (1972) makes the loading (along with the buyer's risk aversion) the key determinant of insurance purchasing; they note that neither the probability of loss nor average amount of loss appear in the first order conditions for buyers (except via possible income effects on risk aversion).

In the case of health insurance, there are at least two alternative ways of looking at whether the new premiums that will be charged for different kinds of health insurance plans in an exchange (such as the California exchange, named Covered California) differ from previous premiums. One way is to look at premium *opportunities* for potential buyers: how does the set of premiums and products after reform compare with the set of premiums and products available before reform for the full set (whatever it is) of consumers before and after reform. This set presumably includes people without an attractive group insurance option, some of whom previously decided to buy individual insurance and some of whom decided to remain uninsured. There is obvious imprecision both in defining this population and

measuring the "opportunities" offered from a range of insurers. The alternative which we follow is to

focus on those who did purchase individual insurance in the prior period (a defined population) and

compare what they paid and received in that period with an estimate of what they might pay and buy in

the post-reform period.

III. Prior Research on the Effect of ACA on Premiums and Coverage

CBO and Industry Projections. The ACA's potential impact on insured medical costs and premiums has

been controversial since the legislation was introduced. The U.S. Congressional Budget Office (CBO)

analysis of the Senate bill that essentially became the ACA projected that broader coverage

requirements and attendant increases in utilization of medical care would increase average premiums

(before subsidies) for the individual market by 10 to 13 percent by 2016 compared with prior law,

without considering potential adverse selection (CBO, 2009). The CBO projected increase was 27 to 30

percent exclusive of assumed savings in administrative costs. However, controlling for coverage, the

CBO projected that premiums would fall after the ACA because they assumed that the new risk pool

would include more younger formerly uninsured persons. Even though the uninsured were assumed to

be in somewhat poorer health, given age, and even though some very high risks excluded by

underwriting would now be in the pool, the CBO forecast a moderately lower average premium for

given levels of coverage because of the larger proportion of younger people assumed to enter the pool.

It is important to note that the CBO model did not rely on data on premiums and coverage that actually

prevailed before the ACA, but was instead driven by differences in indicators of risk levels in population

subgroups before and after an approximation to universal coverage. More recently, the CBO (2014)

estimated that average premiums (including previously regulated states) for the lowest premium silver

plan on exchanges in 2014 would be 15 percent lower than it had projected in 2009, based on updated

estimates of the age, sex, health status, and geographic distribution of those who would be obtaining coverage through the exchanges, attributing the reduction in part to the use of narrow networks and lower provider payments.

Industry studies. In contrast to the initial CBO projections two industry sponsored studies projected much larger increases in medical costs and premiums. These increases were forecasted to arise from assumed increases in utilization of care and adverse selection associated with the new rating rules and relatively low penalties for violating the individual mandate (Oliver Wyman, 2009; Price Waterhouse Coopers, 2009).

Website comparisons. The announcement of individual market premium rates for coverage in the exchanges has spawned a variety of comparisons to pre-reform rates. This largely informal literature commenced with California, which was one of the first states to publish its exchange premiums and details of coverage. The main challenge in such comparisons is to find a measure of premiums and coverage in the prior period. Different plans offer coverage that differs in at least two important dimensions: the expected insurance benefit payments relative to total payments for covered services (the "Actuarial Value" [AV] of the insurance), and non-financial dimensions of coverage like the form and breadth of a PPO network, which physicians in the network are accepting new patients, and the aggressiveness of insurer rules for coverage that may deny payment for covered services. Especially in California, it is appropriate to say that a major challenge is an "oranges-to-oranges" comparison of insurance products.

Those who initially claimed that reform dramatically raised prices in California used as their comparison the exchange premiums for the relatively modest number of Bronze and Silver plans it offers (almost all managed care or PPO in some fashion) compared to selected premium quotations on health insurance websites in the current period, but without necessarily controlling for their generosity of coverage or

type of managed care. Roy (2013a), for example, compared the premiums announced for Bronze plans on the California exchange with the lowest premiums (for people of a given age and gender) on health insurance websites. But, even apart from selective underwriting, the lowest premiums on the website are likely to reflect less generous coverage than the lowest premium exchange plan, so this comparison would lead to an overestimate of the "coverage adjusted" sticker shock. An alternative conclusion from California exchange management was that reform lowered premiums, based on a comparison of individual market exchange premiums for Bronze and Silver plans to premiums for small group insurance (Covered California, 2013). But average small group coverage was probably more generous than the Bronze and Silver exchange plans.

On their face, both of these comparisons are lacking. The low premiums on websites were for plans which could have higher levels of cost sharing than the comparison plans in the exchange and subject to underwriting rules which may make them unavailable to higher risk people who are guaranteed access to coverage in the exchange, and the generosity of group insurance is usually greater than that of even the "Silver" exchange premiums.

Following up on Roy's initial analysis of California, the Manhattan Institute used data available from the finder.healthcare.gov website to calculate average pre-ACA premiums among six age-gender cohorts for the five lowest premium plans in the most populous zip code in each county and state (Manhattan Institute, 2013). Using "denial" and "surcharge" data from the government website, a weighted average rate was calculated for each cohort assuming a 75 percent premium increase for those surcharged and that those denied found coverage at three times the original rate. The statewide average of the adjusted rates for each cohort was then compared to the average exchange premium across counties for the five cheapest plans in each state. Based on this comparison, the average rates for the exchanges

were 41 percent higher than the pre-ACA adjusted rates, with substantial variation across states (Roy, 2013b).

Surveys. The Kaiser Family Foundation fielded a modest survey of premiums paid in the pre-ACA period. Its data provided only nationwide averages across all states, including those that formerly required community rating or had strong limits on underwriting (Kaiser Family Foundation, 2010). This survey sampled 1,038 individuals and found an average annual premium paid (in 2010) of $3,606, accompanied by an estimate of average out of pocket payments not covered by insurance of $924. A much larger survey conducted by AHIP tabulated average premiums on policies sold but did not explore average out of pocket payments (AHIP, 2009). That survey, of several million policies sold by AHIP member companies, found an average premium in 2009 of $2,985.

Simulation models. Three studies (Parente and Feldman, 2013; Gabel et al., 2012; Nowak et al., 2013) used simulation models both to forecast spending and premiums in the pre- and post-reform period. These studies were completed before exchange premiums were announced. They relied on data on the distribution of spending, and then used that data along with assumptions or information about nominal coverage provisions and administrative loading (and subsides post-ACA) to develop estimates of premiums and out of pocket payment before the ACA and forecasts of premiums and out of pocket payments after reform. All three studies concluded that there would be moderate increases in premiums paid compared to the pre-reform period. Gabel et al. (2012) and Nowak et al. (2013) estimated average out of pocket payments in the pre reform period to be high enough that the actuarial value of coverage in that period was below the "bronze" (60%) standard—implying that higher post reform premiums were accompanied by lower out of pocket payments. Parente and Feldman (2013) focused only on premiums.

Conclusion. It might be argued that premium comparisons of these sorts provide useful information on the magnitude of premium changes that some buyers might face due to the ACA. At a minimum, however, a fuller analysis of the ACA's financial effects on health insurance buyers requires some consideration of coverage actually purchased pre-ACA and potential ACA-induced changes in the generosity of coverage. There exist serious data challenges in identifying similar plans and similar populations for undertaking such analysis. There is, as far as we know, no large sample of pre-ACA data on private insurance premiums, details of coverage (or the actuarial value), and market shares of different plans for California or other states. For example, sources like the Medical Expenditure Panel Survey (MEPS) that provide some (though not all) information on coverage do not provide premiums, and sources like the survey of consumer expenditures that provide premiums do not provide details of coverage.[2]   Simulation models are not based on data from actual behavior. And studies based on website quotes do not provide precise measures of the generosity of coverage.

IV. The Problem and a Simple Model

The ideal data to answer the question posed would have detailed information for a large sample on premiums paid and quoted, the details of coverage (including provider networks), and the risk levels and preferences of each buyer. As far as we are aware, there is no such data for a representative population for the pre-reform period. Proprietors of websites sometimes know which buyers used their websites to buy which products, but that is by no means representative of all potential or actual buyers, and they do not know the premium finally charged (after underwriting adjustments).

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[2] The U.S. Government Accountability Office (2013) summarizes individual market coverage terms by state using data reported by carriers to the U.S. Department of Health and Human Services, but the data do not include market shares of different plans.

The largest sample survey of individual health insurance purchases in California and other states comes from the Census Bureau's *Current Population Survey*. In addition to demographics, this survey asks respondents annual premiums paid and annual total out of pocket spending on health care, including both premiums and out of pocket payments at the point of use.

We begin our analysis by outlining some simple models of insurance options and consumer demand, beginning with a descriptive model of the changes in financial flows and moving on to add utility functions with risk aversion. We first develop a representative buyer model, and then modify it to add heterogeneity in demand arising from variations in risk aversion and expected benefits.

V. The Buyer's Perspective: Descriptive Model

The ideal economic evaluation of "sticker shock" would be a calculation of the change in welfare for different population groups caused by the ACA, where the change in welfare is related to the varying characteristics of insurance discussed above. Rather than tackle this complex problem, we begin with a key measure of the ACA's impact: its effect on the expected total payments that consumer will make for insurable health care. This is an important determinant of value and the average financial (and distributional) effect of reform even though it does not consider that the welfare effects of risk reduction. Later in the paper we will add a measure of the value of any change in the risk of out of pocket payment by risk averse buyers to convert financial measures to welfare measures.

We will assume (as do insurers) that buyers fall into different "risk subgroups" based on their characteristics which predict medical spending. Regardless of the premium, the value of a given insurance policy is then related to the expected value of out of pocket payments from its cost-sharing provisions.

An insurance plan for persons in a given risk category "i" can then be evaluated in terms of its "Total Expected Price" (TEP), defined by:

$$TEP_i = P_i + OOP_i$$

where P_i is the average premium paid by person in risk category i, OOP_i is the average expected amount paid out of pocket, and TEP_i is the sum of the "average person's" premium and the average person's expected value of out of pocket payments in risk category i.

This definition of price automatically "quality adjusts" for variations across insurance plans and purchasers in cost sharing (explicit and implicit): someone who pays a low premium for a plan because it has high cost sharing should have higher out of pocket payments on average than someone who pays a high premium for a more generous plan. It represents a complete summary of the consequences of health reform for a given population subgroup in terms of expected financial costs (and the expected amount left over for other spending out of a given level of income). If all individuals in a given risk category expect the group average expense, it also provides a measure of each person's expected out of pocket cost and each person's total expected price.

Of course, TEP ignores two potentially important additional factors that need to be included in a full welfare evaluation. First, even if TEP is unchanged, alterations in the variation in actual out of pocket spending about the mean or expected value of potential out of pocket payments will affect welfare if consumers are not risk neutral. One way to represent this change is to consider the change in "risk premium," a money measure of the change in willingness to pay to avoid risk. This certainty equivalent is a measure of welfare for consumers with preferences satisfying constant absolute risk aversion (CARA). In section VIII we compute changes in risk premia as TEP changes due to reform.

The other consideration is that the form of insurance (primarily the proportion paid out of pocket but also features of managed care) may lead to a different level of both use of care and spending—moral hazard. More generous coverage will usually lead to more total spending (an increase in premiums for sure and even an unpredictable change in average out of pocket spending) but on care of value less than its market price.[3]

The benchmark comparison of price before and after reform for any individual is then a comparison of TEP before (which can be observed in data available to us) and an estimate of TEP afterwards (which requires assuming that some exchange plan with a given premium is selected). We then use an estimate of the AV for a given exchange plan for the consumer to get a predicted value of that consumer's associated expected out of pocket payment after reform.

VI. Specification of Hypotheses: The ACA and Changes in Premiums Given Coverage

The ACA put in place premium and underwriting rules that would be expected to change premiums for a given nominal amount of coverage (e.g., as described by actuarial value) for former individual market purchasers. The prohibition on medical underwriting, to begin with, would mean that more high risks (given demographic characteristics) would be included in the risk pool.

The change in composition by age and gender is more complex. The ACA made premiums uniform by gender and permitted variation by age only by a ratio of 1 to 3 (from age 21 to age 64). It was believed that individual insurers had been charging higher premiums to women of childbearing age compared to men of the same age, and that the age-premium gradient was 1 to 5.

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[3] The relationship of insurance to network breadth is more complex: two plans with the same within-network cost sharing but different degrees of generosity for out of network providers will presumably display on average different out of pocket payment levels, as people in the narrower network go outside more frequently and pay more. Thus some trace of the consequences of network generosity appears in data on out of pocket payments.

Had the risk pool after the ACA remained the same as the pre-ACA risk pool for individual purchasers, one would predict no change in average benefits for a given nominal amount of coverage and (assuming no appreciable change in loading) no change in average premiums for that coverage, but with a reduction in premiums for older men and younger women, offset by increases for younger men and older women. However, the potential addition of formerly uninsured buyers would mean an increase in premiums because they were sicker than average but a fall in average premiums if they contained a larger share of younger (healthy) persons (especially men) than was true previously among the buyers of individual insurance.

Table 1 shows a simple numerical example to illustrate these points. We assume that there are equal numbers of young men and old men. Before reform the monthly premiums for some nominal policy were $200 for young men and $1,000 for old men (a one to five ratio). We also assume that an increase in average risk from prohibition of underwriting, given age, increases premiums by 20%. That effect combined with the new limits on the age gradient is shown in the second line: premiums increase for young men to $360, and for old men to $1,080. The dollar amount of the increase for young men is larger than for older men but modestly so; the percentage increase is much larger for young men. Predictions of premium changes depend on what the pre-ACA age and gender premium gradients actually were in the pre-ACA era, and it has not been established that they actually displayed a five to one ratio or differences across genders. For the age gradient, the presence of guaranteed renewability features in individual insurance (required by law in the pre-ACA period) means that premiums are "frontloaded" which will tend to decrease the age gradient in premiums relative to the age gradient in expected benefits for given nominal coverage. Conversely, the age gradient in benefits for policies of given average actuarial value may be affected if actuarial value varies with age. For example, if a larger share of benefits for older persons is above a bronze deductible, a 60% average actuarial value may be consistent with a less than 60% value for younger buyers (and therefore lower premiums in the pre-ACA

period) and a greater than 60% value for older buyers. Imposing the one to three rule therefore will make the age gradient less steep.

Finally, there may be systematic difference in risk pools in different geographic areas before reform. If the risk pool pre-reform contained relatively more high risks in California than in the Federal HIX states, the change in average premium and TEP from reform will be different.

This simple analysis predicts an increase in premiums (given coverage) on average at all age and gender combinations. It also predicts a similar increase in average out of pocket payments as risk increases. Thus total prices (premiums plus out of pocket payments) are expected to rise. To the extent that higher risks from the formerly uninsured population choose silver rather than bronze coverage, the increase in expected insurable expenses will be larger there. Even if silver and bronze premiums are adjusted for any variation in risk, a feature not well specified in the implementation of the ACA, out of pocket payments will not be adjusted and so the increase in TEP would be smaller for bronze purchasers than for silver purchasers, because any risk adjustment would apply to a smaller fraction of total spending for bronze purchasers.

The analysis also predicts some variation in the change in premiums and TEP across age-gender cells. Increases should be larger in dollar amounts for younger men and older women. In percentage amounts increases should be smaller for older men and larger for younger men.

VII. Sample and Data

We examine the change in TEP for two different populations formerly purchasing individual insurance: purchasers in California, and purchasers in the 23 states without significant restrictions on rate variation before the ACA, where the federal government is now administering the exchanges. We do not make a

distinction between full federal administration and various forms of state-federal partnerships, but do exclude all states (other than California) where there is no direct federal role. We chose California because it is the largest population subject to a single exchange structure and because the state has taken an aggressive role in design and execution. We chose federal HIX both because of expected uniformity and because the exchange itself will take a more passive role than in the great bulk of state exchanges. (We focus on the federal HIX states that previously had no limits on premium rating in the individual market in the pre-reform period; our results are qualitatively similar if we include the additional 11 states with such regulation for a total of 34 federal HIX states.)

The data on premiums and out of pocket payments before the ACA come from the Current Population Survey (CPS), a survey of a large representative sample of the United States population.[4] The sample includes adults who are both citizens and legal immigrants. We use the answers to questions about the premium paid over the previous year for coverage for individuals (for those with self only coverage) and their answers to a question about the total amount spent out of pocket (not covered by insurance) on medical care. If there is charity care or failure to pay medical bills, this measure will differ from total charges incurred by the person, but it is a measure of the financial consequences of their medical transactions. The CPS survey is a point in time survey and so does not contain measures of premiums or coverage for those who died in the previous twelve months; we later consider some corrections for this understatement.

We edited the CPS responses to premiums by deleting observations where the annual premium was below $600 or above $12,000.[5] Thus we analyze changes in TEP for those who bought individual policies

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[4] The CPS is also the primary source of information on the proportion insured and uninsured.
[5] Dropping observations with very high premiums, which may be subject to measurement error and can severely influence the mean, serves to overstate any increase in prices from the ACA. Our qualitative conclusions are unchanged if we drop observations exceeding $36,000 in annual premiums.

with premiums in between these levels. Those who bought insurance with very low annual premiums are better grouped with the uninsured.

We combined CPS data for surveys from the years 2010 through 2012 inclusive. We "inflate" both premiums and out of pocket spending by an index of inflation using the Consumer Price Index; we test the sensitivity of our results to the index used. This was a period of historically low growth in prices for medical care and all goods so the choice of index is not of great importance.[6] We do not account for possible growth in insurer administrative costs above or below the index rate or changes in the volume of care that might have affected premiums between the time of data collection and ACA implementation.

To provide a comparison with the post ACA period, we identify the lowest priced bronze plan and the lowest and second lowest priced silver plans in each state. To estimate out of pocket payments under each of these plans, we apply representative cost sharing provisions of these plans to national spending data from the Medical Expenditure Panel Survey (MEPS) for adults who bought individual plans for age-gender cells. That spending data was then adjusted to each state's spending level using the ratios of state to national per capita spending. Appendix 1 describes this calculation. The overall average value of out of pocket spending represents the distribution of individual insurance purchasers in the CPS matched by age and gender.

VIII. Results

We first show comparisons of changes in mean premiums and out of pocket payments for the full sample of individually insureds in California and the federal HIX states. We then provide analysis to

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[6] Using the Medical Care component of the CPI instead, our estimated changes in price levels differ by less than 10 percent compared to our central estimates that use the All Items CPI.

identify any statistically significant deviations from mean changes by age-gender subgroups. Finally, we use regression analysis of the relationship between observed buyer characteristics and changes in premiums, out of pocket payments, and total expected price to provide insight into the potential effects of the law on buyers' risk and estimated risk premia.

Table 2 shows the average change in TEP in dollar values and percentage changes in California and the federal HIX. Tables 3 and 4 show mean dollar values for premiums, out of pocket payments and TEP overall, by gender, and by age gender subgroups for California and Federal HIX respectively.

As indicated in Table 2, TEP increases in both subsamples, with the size of the increase depending on the metallic level and premium of the post ACA-comparator. The overall percentage increases in TEP range from about 14 percent to about 28 percent. Compared to the lowest priced bronze plan, the mean pre-ACA premium was almost identical, but the mean out of pocket payment was considerably lower. In contrast, the pre-ACA average premium was lower than the lowest silver plan premium, but the difference in mean out of pocket payment was small. The implication is that the average actuarial value of individual plans in the pre-ACA period was higher than bronze and similar to silver. Of course, there is variation about the mean so the AV of many of the pre-ACA plans could have been lower than that of the benchmark bronze plans.

The mean increase in TEP in dollars ranged from $694 (for bronze federal HIX plans) to $1,414 (for the second lowest priced silver plans in California). The changes were quite similar in the two settings (California and Federal HIX), with the largest increase limited to those who chose the more costly silver plan.

There is considerable variation across the age-gender cells, as shown in Tables 3 and 4. However, the estimated differences in TEP for various age-gender cells in California were were not significantly different from the overall means, except for older women (Table 5, top panel). The older women subset

also experienced a significantly above-average increase in TEP in the federal HIX sample (Table 5, bottom panel), but so did older men. The latter finding appears to reflect larger proportions of healthier than average buyers among older men in those states in the pre-ACA market, relative to California. The CPS indicates that 56 percent of older women have very good or excellent health in California compared to 61 percent in the federal HIX. For men, the percentages are 45 percent versus 52 percent. Other men generally experienced below average dollar increases in TEP in the federal subsample.

IX. Regression Analysis and Risk Premiums

We developed a simple regression models to predict spending, premiums and expected out of pocket payments in the pre-ACA period for individuals with different risk characteristics. Since risk is the difference for a person with a given set of characteristics between actual out of pocket payment and predicted out of pocket payment, this model provides a more relevant estimate of expected out of pocket payment and its change than age-gender mean values for consumers with rational expectations. For California, the regression model was consistent with the comparison of means in that age and gender usually were not significant predictors of out of pocket spending. A measure of contemporaneous health status was significant, as was the premium. Table 6 presents variances of OOP spending based on the standard error of the prediction from these regressions.

We show several calculations of the risk premiums for changes in coverage depending on the model used to generate an estimate of mean out of pocket spending (Table 7). The risk premium is calculated as one half times the difference in variances multiplied by the coefficient of constant absolute risk aversion (CARA). We use a CARA coefficient of 3.4 x 10-4, in line with the results from Cohen and Einav (2007). As might be expected, because the regression model explains more of the variation in out of pocket spending than does age and gender alone, the risk premium falls somewhat when that model is

used. However, the overall risk premia generally are modest, largely because the change in coverage

from the pre ACA period to either bronze or silver coverage was modest.

X. Validity Checks and Sensitivity Analysis

We used data from the Current Population Survey because it is the only source of data on a large

enough sample to support analysis at the state level. Even here, however, the sample size in some

states or demographic groups is sometimes relatively modest. Moreover, the CPS is a household survey,

and so problems with recall and the absence of fidelity checks may introduce errors. How valid are

estimates based on this data? One check is provided by comparison of values from our CPS data set

with those from other sources that measure out of pocket payments or premiums.

One source of data on out of pocket payments is the MEPS data which, though a household survey, had

multiple validity checks on respondents answers (by linking to provider billing data and insurer records),

and which was specifically designed to provide reliable estimates of out of pocket payments (Sing et al.,

2006).   The distribution of MEPS values for out of pocket payments for the individually insured are very

close to the estimates in our two data sets (which are similar to each other), as shown in Figure 1.

Another source of error would be omission of expenditures for people who died. The death rate for

adults aged 25 to 65 is about 5 per 1000. If we assume that decedent had out of pocket payments ten

times higher than average out of pocket payments of survivors, adding in this spending would increase

the dollar amount of average out of pocket payment by 5%, and TEP by about 2%. Note, however, that

the MEPS data used to generate estimates of the distribution of average out of pocket payments in the

post ACA period also underestimates this spending. However, because of the required cap on annual

out of pocket spending after reform the error in those estimates may be smaller.

XI. Discussion

Our results suggest that health reform did produce increases in spending for those who previously bought individual insurance and switched to bronze or silver plans in California and in the largely unregulated states that now use federal exchanges. Because the level of out of pocket payment was not much different in the pre-reform period from its level under these plans, the largest share of the change was due to higher average premiums. The post-ACA premiums reflected insurer estimates of what they would have to charge to cover the population that would purchase on exchanges. A plausible explanation for the increase in total expected price is that, on average, insurers after reform are expected to attract buyers who would have moderately higher expected benefits than those received by the population previously buying individual coverage. Apparently insurers who sold the higher cost silver plans built in a larger correction for this possibility. One implication is that the change a former purchaser of individual insurance would experience depends on which plan among the post reform plans that person would choose; shopping behavior is important.

There was only a moderate increase in the size of the change in TEP moving from bronze to silver plans. Some increase would might have been expected because of the greater administrative cost associated with a larger fraction of expenses run through insurance. The remaining larger increase in TEP for lowest priced silver over bronze plans (of about $100) presumably represents higher risks gravitating toward the former.

Based on the analysis of data in states where health reform was most likely to increase what purchasers of individual insurance had to pay, our conclusion is that the average "sticker shock" is definitely positive but considerably lower than implied by previous analyses of sticker shock based on premium quotes. In terms of average financial costs and financial protection without consideration of premium subsidies,

the consequences of reform would appear to be more moderate than has often been claimed. Major

changes in welfare, if they exist, may be more likely to come from network access and quality.

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Table 1. Hypothetical Example of the Impact of ACA on Monthly Premiums for Men.

	Young	Old	Average
Before	200	1000	600
After	360	1080	720
Change ($)	160	80	120
Change (%)	80	8	20

Table 2. Increases in TEP Relative to Pre-ACA, overall.

	California		
	(1)	(2)	(3)
	Bronze min	Silver min	Silver 2nd lowest
Dollar Amounts	723	860	1414
Percentage Change	14.3***	17.0***	28.0***
	(8.2, 20.4)	(10.9, 23.2)	(21.8, 34.2)
Observations	535	535	535
	Federal HIX		
	(4)	(5)	(6)
	Bronze min	Silver min	Silver 2nd lowest
Dollar Amounts	694	926	1165
Percentage Change	14.5*	19.4***	24.4***
	(3.1, 25.9)	(9.0, 29.7)	(14.6, 34.1)
Observations	1,959	1,959	1,959

*p<0.1, **p<0.05, ***p<0.01. 95 percent confidence intervals of percentage change in parentheses. In Federal HIX regressions, standard errors are clustered by state.

Table 3. TEP, Premiums, and OOP Before and After the ACA: California, all consumers.

| | Pre-ACA | | | Post-ACA | | | | | | | | |
| | | | | Bronze (min) | | | Silver (min) | | | Silver (2nd lowest) | | |
Group	Annual premium	Annual OOP	Annual TEP	Annual premium	Annual OOP	Annual TEP	Annual premium	Annual OOP	Annual TEP	Annual premium	Annual OOP	Annual TEP
TOTAL	**3,967**	**1,085**	**5,052**	**4,017**	**1,758**	**5,775**	**4,688**	**1,224**	**5,912**	**5,242**	**1,224**	**6,466**
Men												
All men	**3,712**	**815**	**4,527**	**3,740**	**1,237**	**4,978**	**4,364**	**886**	**5,250**	**4,880**	**836**	**5,715**
25 to 34	2,334	551	2,886	2,462	885	3,347	2,871	671	3,542	3,211	671	3,883
35 to 44	3,020	637	3,658	2,783	1,096	3,879	3,247	800	4,047	3,631	800	4,431
45 to 54	3,637	593	4,230	3,806	1,207	5,012	4,443	900	5,343	4,967	900	5,867
55 to 64	5,802	1,423	7,226	5,813	1,754	7,567	6,783	1,172	7,955	7,583	1,172	8,756
Women												
All women	**4,215**	**1,347**	**5,562**	**4,286**	**2,264**	**6,550**	**5,003**	**1,553**	**6,555**	**5,593**	**1,553**	**7,146**
25 to 34	2,651	643	3,294	2,406	1,827	4,233	2,805	1,290	4,095	3,138	1,290	4,427
35 to 44	2,937	1,135	4,072	2,788	1,821	4,609	3,253	1,291	4,544	3,637	1,291	4,927
45 to 54	4,048	1,315	5,363	3,839	2,149	5,988	4,482	1,501	5,983	5,012	1,501	6,513
55 to 64	5,397	1,751	7,148	5,844	2,658	8,502	6,821	1,778	8,599	7,625	1,778	9,403

Table 4. TEP, Premiums, and OOP Before and After the ACA: Federal HIX, all consumers.

| | Pre-ACA | | | Post-ACA | | | | | | | | |
| | | | | Bronze (min) | | | Silver (min) | | | Silver (2nd lowest) | | |
Group	Annual premium	Annual OOP	Annual TEP	Annual premium	Annual OOP	Annual TEP	Annual premium	Annual OOP	Annual TEP	Annual premium	Annual OOP	Annual TEP
TOTAL	**3,537**	**1,240**	**4,777**	**3,576**	**1,895**	**5,471**	**4,388**	**1,315**	**5,703**	**4,627**	**1,315**	**5,942**
Men												
All men	**3,549**	**1,050**	**4,600**	**3,406**	**1,426**	**4,833**	**4,179**	**1,004**	**5,183**	**4,407**	**1,004**	**5,411**
25 to 34	2,240	584	2,824	2,117	990	3,108	2621	739	3,360	2,745	739	3,484
35 to 44	3,143	632	3,776	2,441	1,181	3,622	2,998	861	3,859	3,163	861	4,025
45 to 54	3,804	1,326	5,130	3,360	1,396	4,756	4,102	1,019	5,121	4,327	1,019	5,346
55 to 64	4,388	1,312	5,700	4,807	1,873	6,679	5,898	1,239	7,137	6,232	1,239	7,471
Women												
All women	**3,524**	**1,455**	**4,979**	**3,767**	**2,421**	**6,188**	**4,623**	**1,664**	**6,288**	**4,873**	**1,664**	**6,538**
25 to 34	2,508	824	3,332	2,096	1,973	4,070	2,561	1,397	3,958	2,697	1,397	4,095
35 to 44	2,990	1,004	3,994	2,397	2,012	4,409	2,921	1,404	4,325	3,085	1,404	4,489
45 to 54	3,851	1,615	5,466	3,402	2,298	5,700	4,174	1,606	5,780	4,416	1,606	6,022
55 to 64	3,823	1,698	5,521	4,943	2,763	7,706	6,077	1,863	7,941	6,396	1,863	8,259

Table 5. Redistribution by Age and Sex: TEP Difference Relative to Grand Mean TEP Difference.

A. TEP: CA

	Bronze (min)		Silver (min)	
	Difference minus grand mean difference	p-value	Difference minus grand mean difference	p-value
Men 25-34	-262	0.458	-204	0.564
Men 35-44	-502	0.238	-471	0.270
Men 45-54	59	0.886	253	0.537
Men 55-64	-382	0.301	-131	0.723
Women 25-34	215	0.620	-60	0.891
Women 35-44	-186	0.744	-388	0.496
Women 45-54	-99	0.793	-240	0.525
Women 55-64	630	0.022	590	0.032

B. TEP: Federal HIX

	Bronze (min)		Silver (min)	
	Difference minus grand mean difference	p-value	Difference minus grand mean difference	p-value
Men 25-34	-409	0.118	-389	0.138
Men 35-44	-846	0.005	-841	0.006
Men 45-54	-1,067	0.000	-933	0.000
Men 55-64	287	0.166	513	0.013
Women 25-34	46	0.889	-298	0.363
Women 35-44	-278	0.473	-594	0.125
Women 45-54	-459	0.057	-611	0.011
Women 55-64	1,493	0.000	1,495	0.000

Table 6. Variance, $ millions: Regression adjusted estimates, MEPS sample.

|	Simple regression adjustment			Rational expectations		
	Pre-ACA	Bronze	Silver	Pre-ACA	Bronze	Silver
Total	**2.3**	**3.2**	**1.2**	**1.5**	**2.0**	**0.7**
Men 25-34	1.1	1.9	0.8	0.2	1.1	0.5
Men 35-44	2.4	2.7	1.1	1.6	2.4	1.0
Men 45-54	1.7	2.5	1.0	1.1	2.0	0.8
Men 55-64	1.7	3.5	1.1	2.6	1.7	0.6
Women 25-34	2.2	3.9	1.6	1.9	4.5	1.5
Women 35-44	2.9	3.3	1.3	0.4	1.6	0.5
Women 45-54	2.4	3.6	1.4	2.1	2.5	0.8
Women 55-64	3.4	3.8	1.4	1.8	1.8	0.8
N	1,443	1,443	1,443	380	380	380

Simple regression adjustment includes demographic indicators and region indicators. Rational expectations regressions demographic indicators, region indicators, and lagged measures of total spending, OOP, chronic conditions, self-assessed health status, race/ethnicity, and body mass index.

Table 7. Risk premium calculations ($).

	Simple regression adjustment		Rational expectations	
	Bronze	Silver	Bronze	Silver
Total	**-150.6**	**185.5**	**-88.4**	**130.6**
Men 25-34	-130.3	64.8	-160.4	-50.0
Men 35-44	-49.8	227.4	-146.1	99.8
Men 45-54	-140.4	123.0	-146.1	59.7
Men 55-64	-294.4	103.0	146.2	342.0
Women 25-34	-283.3	102.9	-439.8	69.3
Women 35-44	-82.3	265.5	-209.9	-19.6
Women 45-54	-207.0	162.3	-80.4	218.6
Women 55-64	-69.8	339.5	-5.2	169.1
N	1,443	1,443	380	380

Simple regression adjustment includes demographic indicators and region indicators. Rational expectations regressions demographic indicators, region indicators, and lagged measures of total spending, OOP, chronic conditions, self-assessed health status, race/ethnicity, and body mass

Figure 1. Distributions of Out-of-Pocket Payments
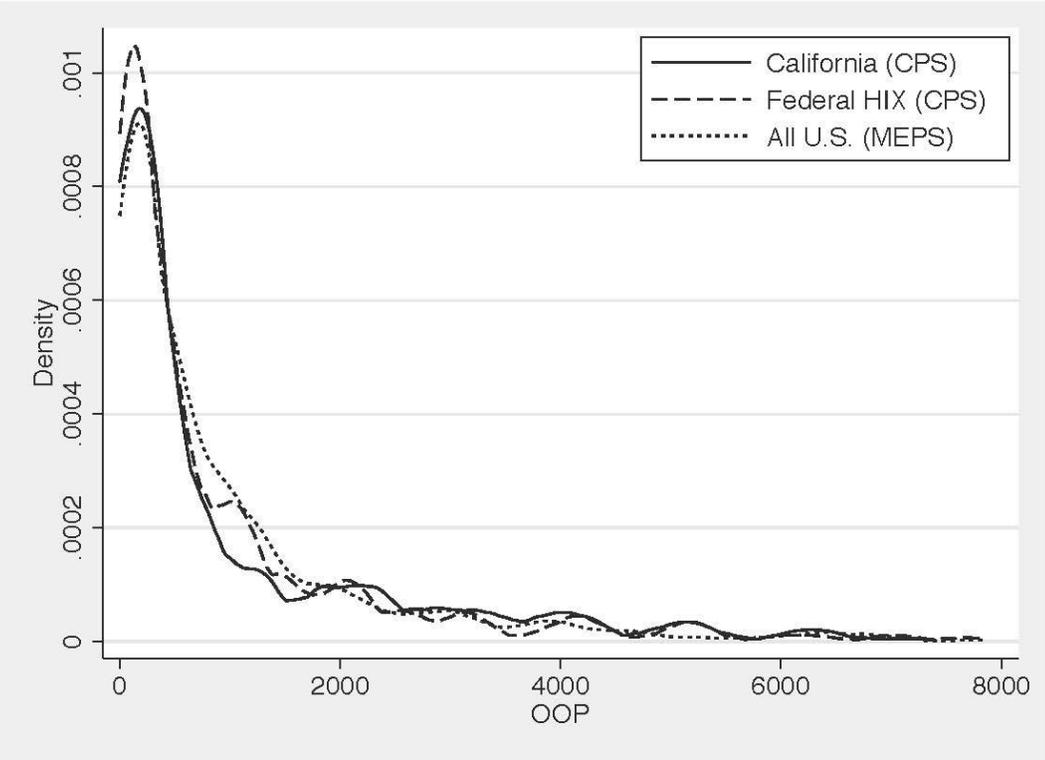
Appendix 1. Description of Post-ACA OOP Estimation Method

1. Adjust MEPS total health spending for differences between California and other states. To adjust national spending to California, we multiply total spending of each MEPS observation by 0.9125, based on the assumption that spending in California is 90 percent of that in other states (using the means of OOP in the CPS) and California is one eighth of the national population $(0.9125=0.9*(7/8)+1*(1/8))$. To adjust national spending to the Federal Exchange states, we multiply total spending of each MEPS observation by 1.0138 using the same assumptions $(1/0.9)*(1/8)+1*(7/8))$.

2. Inflate geographically-adjusted OOP spending from step 1 to 2014 dollars using the all-items price index for urban consumers from the Bureau of Labor Statistics (BLS).

3. Calculate actuarial value by age and sex using spending from step 2 for the privately insured population in the MEPS (individual market only) and the representative benefit design of Bronze and Silver plans. To increase sample size, we pool years 2005 through 2011 from the MEPS, which yields 1,313 observations with full-year insurance coverage in the individual market. For benefit design, we use a $6,350 OOP maximum in both metal tiers, a Silver deductible of $1,500 and a Bronze deductible $3,000, and Silver coinsurance of 20 percent and Bronze coinsurance of 40 percent. We perform this calculation on records in the MEPS above 138 percent of poverty and are between ages of 27 and 64. We also exclude people who either have public coverage only or are uninsured.