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THE PRICE OF RESPONSIBILITY: THE IMPACT OF HEALTH REFORM ON NON-POOR UNINSUREDS

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ABSTRACT

This paper estimates the change in net (of subsidy) financial burden ("the price of responsibility") and in welfare that would be experienced by a large nationally representative sample of the "non-poor" uninsured if they were to purchase Silver or Bronze plans on the ACA exchanges. The sample is the set of full-year uninsured persons represented in the Current Population Survey for the pre-ACA period with incomes above 138 percent of the federal poverty level. The estimated change in financial burden compares out-of-pocket payments by income stratum in the pre-ACA period with the sum of premiums (net of subsidy) and expected cost sharing (net of subsidy) for benchmark Silver and Bronze plans, under various assumptions about the extent of increased spending associated with obtaining coverage. In addition to changes in the financial burden, our welfare estimates incorporate the value of additional care consumed and the change in risk premiums for changes in exposure to out-of-pocket payments associated with coverage, under various assumptions about risk aversion. We find that the average financial burden will increase for all income levels once insured. Subsidy-eligible persons with incomes below 250 percent of the poverty threshold likely experience welfare improvements that offset the higher financial burden, depending on assumptions about risk aversion and the value of additional consumption of medical care. However, even under the most optimistic assumptions, close to half of the formerly uninsured (especially those with higher incomes) experience both higher financial burden and lower estimated welfare; indicating a positive "price of responsibility" for complying with the individual mandate. The percentage of the sample with estimated welfare increases is close to matching observed take-up rates by the previously uninsured in the exchanges.

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I. INTRODUCTION

A major objective of the Affordable Care Act (ACA) is to reduce financial barriers to insurance, and thus to change the patterns of care and the total amount of care consumed. The ideal outcome envisioned by designers of the law was near-universal coverage, with virtually all Americans covered by health insurance. Such an outcome would presumably please the bulk of the population that was and is insured and that previously paid for charity and bad debt care used by the uninsured. But what would its effect be on the financial and economic welfare of those formerly uninsured people? That is the question this paper addresses.

The law includes three main provisions intended to reduce the number of uninsured with incomes above the Medicaid eligibility threshold of 138 percent of the Federal Poverty Level (FPL): (1) an individual *mandate* that will impose a fine if individuals remain uninsured (subject to an exception if coverage is "unaffordable"); (2) insurance premium *subsidies* to persons with incomes below 400 percent of FPL who obtain individual insurance through the exchanges and insurance cost sharing *subsidies* to persons with incomes up to 250 percent of FPL who obtain selected coverage through the exchanges; and (3) *regulation* of the relative premiums different people pay for individual insurance by prohibiting underwriting and pricing based on health risk and restricting premium variation in relation to age.

There is little evidence on how reform might have affected the financial and economic well-being of these "non-poor" potential enrollees (i.e., those with incomes above 138 percent of FPL). The data does indicate that many previously uninsured individuals who were not poor have obtained coverage through the exchanges during the first two enrollment years. Enrollment data for 2015 indicate that 83 percent of exchange enrollees had incomes less than 250 percent of FPL (ASPE 2015) and that estimated take up rates for exchange coverage by the previously

uninsured decline sharply with increases in income (Avalere 2015).[1] This paper estimates the potential financial and welfare consequences of moving this "non-poor" uninsured population, defined as those with incomes above the Medicaid limit, from no coverage to coverage.[2]

In addition to the ACA's obvious concern for the poor uninsured, there has been considerable policy interest in the larger population of non-poor uninsured for several reasons. Some argue that they act "irresponsibly" in not buying insurance and then failing to pay the full cost of care they receive, relying instead on charity care and bad debt forgiveness. Their irresponsibility is assumed to harm the insured members of the community both because the insured finance some of the care used by the uninsured and because they experience distress in observing the uninsured foregoing needed care due to financial barriers. Others are concerned that, even when the non-poor uninsured are willing to pay the full cost of care out of pocket, they may forgo care of high benefit to themselves and of concern to the rest of the community. Indeed, the provision in the ACA imposing a financial penalty on those who fail to obtain qualified coverage is called the "individual shared responsibility provision."

Reducing the extent and consequences of such "irresponsible" behavior was a major motivation for including the individual mandate in the ACA and other health reform proposals. One key question therefore is the law's effect on the average cost of medical care and insurance now shifted to the formerly uninsured who purchase coverage in response to the law. Another key issue is the extent to which the law reduced the financial risk (variability) in the cost of care for the formerly uninsured. But perhaps the most important key question is the extent to which this population will move from uninsured to insured, and the gains and losses they would

[1] The extent to which previously uninsured persons have obtained coverage outside of the ACA exchanges is not yet known.

[2] Below this income threshold, individuals are eligible for Medicaid unless their state has opted out of the expansion. We consider 138 percent of FPL as the steady-state eligibility level for Medicaid.

experience from doing so. We therefore estimate the average financial impact of the law and other dimensions of welfare change resulting from the value of greater protection against the risk of high out-of-pocket cost and greater use of care.

Our empirical approach begins with a comparison of the payments (all out of pocket) made for care by the uninsured before the ACA to expected benchmark premiums and out-of-pocket payments under ACA Silver and Bronze insurance plans.[3] This comparison estimates the financial effects of coverage for the uninsured who obtain and pay for such coverage. We further estimate the welfare changes from increased coverage by developing estimates of any changes in "risk premiums," the values of increased risk protection. We also estimate the value to the formerly uninsured of any additional care they receive associated with insurance coverage under various assumptions concerning potential increases in the demand for care (whether due to moral hazard or income effects), and valuation of that care. Our estimates account for both premium subsidies and cost sharing subsidies. We focus on the lowest-cost Bronze plan and the second-lowest Silver plan as benchmark post-ACA choices.[4]

Finally, we use the resulting estimation of welfare gains and losses (in a way different from the elasticity-based simulation models used to predict post-ACA takeup) to describe the likely pattern of enrollment in or rejections of the new regulated, subsidized, and penalized options available to consumers after the ACA. Our results should be interpreted as predictions of the financial and welfare implications if nearly all of the uninsured were to purchase these types

[3] The ACA permits five categories of plans to be sold in the individual health insurance market with benchmark actuarial values (percentage of eligible medical costs reimbursed by the plan, in parentheses): Bronze (60 percent), Silver (70 percent), Gold (80 percent), Platinum (90 percent), and catastrophic plans for young adults (< 60 percent). As noted, premium subsidies are available for plans purchased through the ACA exchanges for persons with incomes up to 400 percent of FPL. Cost sharing subsidies are available to purchases of Silver plans with incomes up to 250 percent of FPL.

[4] Premium subsidy amounts are based on the second lowest cost Silver plan offered in an enrollee's geographic rating area.

of coverage as the law intended. We do not estimate any welfare effects for the rest of the community from redistribution of the cost of care or from values they might attach to improved health or reduced financial risk for the formerly non-poor uninsured.

We find that, since the non-poor uninsured previously paid a relatively small share of their medical spending before the ACA and had a low level of total spending and use of care, most of them will experience both high premiums (net of subsidies) and (perhaps surprisingly) high average or expected out-of-pocket payments if they were to buy ACA coverage. At lower income levels, subsidies for premiums and cost sharing will limit the financial costs and incentivize purchase. At all income levels, the premiums will still represent positive payments for those who (by definition) previously paid nothing for insurance, while the effect of coverage in reducing out-of-pocket payments tends to be modest. At higher income levels, small or zero subsidies and currently modest penalties will not be enough to affect the large welfare losses that the middle class uninsured would experience were they to buy coverage. The minority of high risks among the middle class uninsured may gain, but most uninsured will lose and, according to our estimates, will prefer to remain uninsured at the current penalty levels for violating the individual mandate.

So in terms of welfare, our results suggest that many persons with low incomes may fare better after the ACA, but those formerly uninsured at higher incomes not in poor health consistently are worse off from purchasing coverage regardless of the assumptions made regarding spending increases and risk aversion. For those at low income levels, the welfare benefits from Silver coverage in terms of less variable out-of-pocket payments and from increased use of care may outweigh financial costs, leading to welfare improvements even if financial burden increases. Given that insurance reduces the variability of out-of-pocket

payments, the specific magnitudes of the welfare estimates, and the extent to which lower income groups benefit, depend in part on the assumed level of risk aversion and in part on the assumed extent of welfare cost due to moral hazard. We consider a "best-case" scenario in terms of the benefits furnished by insurance that assumes high risk aversion and values additional care equal to its cost (effectively assuming zero welfare cost of moral hazard). Under that scenario, we estimate meaningful welfare gains for the lowest-income group but still estimate sizable average welfare losses for those above 250 percent of FPL, significantly reducing incentives for obtaining coverage to comply with the law.

The paper proceeds as follows. Section II describes the basic empirical framework and data. Section III presents the specific approach to measuring the financial and economic welfare impacts of ACA coverage on the uninsured. Section IV presents results, and Section V concludes.

II. EMPIRICAL FRAMEWORK AND DATA

We use nationwide data from the CPS to measure the nationwide pre-ACA distribution of uninsured persons by age, sex, income, and state. The CPS provides the largest available sample of the uninsured at the state level. Information on the distribution of the uninsured by state is critical for our analysis because ACA insurance premiums vary by state. We use the nationwide MEPS to measure total health expenditures for this population and to estimate out-of-pocket payments in both the pre- and post-ACA periods. The MEPS contains measures of health care utilization and spending both by the patient and by other sources using the most detailed collection methods among nationwide surveys measuring health expenditure (Caswell and

O'Hara 2010), and it is the most frequently used data on total spending and out-of-pocket spending for the uninsured.

Our empirical model then compares the expected value of out-of-pocket payments for the population in the CPS sample of uninsureds with estimates of the sum of the premium and expected out-of-pocket payments for benchmark insurance plans for that population post ACA. That is, the measure of Financial Impact (FI) is defined as:

$$FI = E(OOP_U) - (Prem + E(OOP_I)$$

where $E(OOP_U)$ is the expected out-of-pocket payment when uninsured, $E(OOP_I)$ is the expected out-of-pocket payment under the benchmark insurance plan, and *Prem* is the premium for that plan.

The CPS sample includes adults who are citizens or non-citizen legal immigrants. We exclude observations who have any form of health insurance coverage (public or private), are younger than age 25 or older than 64, or have incomes below 138 percent of the FPL. We also limit the sample to single-person families to reduce possible errors in determining eligibility for family insurance coverage or premium tax credits in the exchanges. We combined CPS data for surveys from the years 2010 through 2012.

Premiums on all plans in each geographic rating area were collected from Healthcare.gov for the states in the Federally-Facilitated Marketplaces (FFM) and from state-based exchanges in State-based Marketplaces (SBM).[5] Premiums can vary within states by rating area. The premiums collected from the government's website are for individuals aged 40. We estimate premiums for other ages of CPS respondents using standard age curves from the Center for

[5] We are grateful to Evan Saltzman for sharing his data on premiums from Taylor et al. (2015).

Medicare and Medicaid Services (CMS) or state-specific age-curves if applicable as published by the Center for Consumer Information and Insurance Oversight (CCIIO).[6]

III. CALCULATION OF FINANCIAL AND WELFARE IMPACTS

A. Premiums and Out-of-Pocket Payments

The measure of financial impact we use is the change in the sum of premiums and expected out-of-pocket payments.[7] This measure automatically adjusts for changes in coverage by using estimates of changes in average or expected out-of-pocket payments. For example, a formerly uninsured person who experiences a reduction in average out-of-pocket payment (after any cost-sharing subsidies) will experience a financial gain if this reduction exceeds the increase in net-of-subsidy premium paid. In the pre-ACA period this measure is obviously just the expected out-of-pocket payment since no premiums are paid.

The measure of premiums is a weighted average of the benchmark insurance premium for each age level and state, weighted by proportions in the CPS population. Within each of a set of income strata (based on income relative to the poverty line), the out-of-pocket payments and premiums are estimated separately for different age-gender subgroups, to reflect both potential demographic effects on out-of-pocket payments and the effect of age on exchange premiums. We then calculate the average difference pre- and post-ACA within each income stratum, using the demographic proportions in the CPS sample as weights.

[6] The age-curve data by state is available at: www.cms.gov/CCIIO/Programs-and-Initiatives/Health-Insurance-Market-Reforms/state-rating.html#age (accessed September 3, 2015).

[7] This measure is the "total expected price" (TEP) from our earlier work (Pauly, Harrington, and Leive 2015), except that pre-ACA TEP for the uninsured only measures expected out-of-pocket payment. Changes in TEP represent the first-order effects of insurance coverage as modeled in the literature on health plan choice (Abaluck and Gruber 2011; Handel 2013; Heiss, Leive, McFadden, and Winter 2013).

Estimated out-of-pocket payments in the pre-ACA period using pre-ACA MEPS data are constructed from predictions from a GLM regression (with gamma family and log link) of out-of-pocket payment against a third-order polynomial in age interacted with sex, variables measuring income levels and ratio to the poverty line, census region of residence, MSA or non-MSA location, race, survey year, and self-reported health status diagnoses of chronic conditions. As described in detail below, we construct different risk groups based on age, sex, health status, and income and take the means from the out-of-pocket payment regression predictions by risk group. Since the MEPS sample is smaller than the CPS, we pool years 2007 through 2012.

To construct the measure of expected out-of-pocket payment under a benchmark ACA plan in the post-ACA period, we use data on total health care spending from the MEPS for each demographic, health status, and income subgroup. We then match MEPS estimates to the demographics of the CPS population within each income stratum. We impose the same restrictions on income and age as we do in the CPS. We inflate both out-of-pocket payments and total spending using the medical care component of the consumer price index from the Bureau of Labor Statistics. We do not use the restricted state-level MEPS because the small sample sizes by state prevents us from estimating spending distributions by age, sex, health status, and income. We instead use the same distributions of spending for all states and do not make any adjustments because analysis with the CPS found that state of residence was an insignificant predictor of pre-ACA out-of-pocket spending.[8]

[8] The CPS contains data on out-of-pocket payments but not total health care spending. Our results are not sensitive to using the CPS to estimate pre-ACA OOP instead of the MEPS. We use the MEPS for pre-ACA OOP because we require its associated measure of total spending to estimate out-of-pocket payments post-ACA. In our previous analysis of those insured in the individual market (Pauly, Harrington, and Leive 2015), we studied the sum of insurance premiums and out-of-pocket payments in the pre-ACA period. Since the two quantities are tied together through coverage generosity, we used the CPS for pre-ACA TEP since it contained both OOP and premiums for large samples by state. Since our focus is now on the uninsured whose premiums were zero in the pre-ACA period, we use the MEPS to estimate out-of-pocket payments both before and after the ACA for consistency.

Measuring premiums and estimating out-of-pocket payments post-ACA requires a number of assumptions. For a given plan, ACA premiums vary by age, geographic region, and smoking status. Net-of-subsidy premiums vary by income level and the second-lowest cost Silver plan in a region. Our calculations are based on non-smoker premiums, which will understate average increases in TEP for the previously uninsured to the extent that post-ACA premiums for smokers are higher than for non-smokers. Enrollees with incomes up to 400 percent of the FPL are eligible for premium subsidies in the form of tax credits. The law stipulates the maximum percentage of modified adjusted gross income that the enrollee is required to pay for coverage according to their income, as shown in the Appendix. The tax credit is calculated as the difference between this maximum amount and their second-lowest Silver plan premium in the person's geographic rating area. This credit can also be directly applied to the premiums of other plans, such as less expensive Bronze plans. We calculate the tax credit using adjusted gross income measured in the CPS.

To provide a range of estimates of the financial impacts under various plan choices, we analyze premiums of the second-lowest premium Silver plan and the lowest premium Bronze plan. The lowest premium Bronze plan corresponds to the cheapest option (ignoring catastrophic plans for ages under 30). The second-lowest premium Silver plan is an important benchmark because it determines the size of the tax credit, and cost sharing subsidies for persons with income up to 250 percent of FPL are only available if a Silver plan is purchased. Evidence from states participating in the Federally Facilitated Marketplace indicates that most consumers chose the lowest or second-lowest cost Bronze and Silver plans (Burke, Misra, and Sheingold 2014). We do not consider what plans the formerly uninsured actually chose in the exchanges, both

because that data is still fragmentary and, more importantly, is endogenous to the TEP measure we seek.

For both the lowest premium Bronze and second-lowest premium Silver plans, we construct a state-level premium average that is weighted by the uninsured population within each county. The uninsured population is measured from the American Community Survey.[9] Ideally, we would match the premiums from each rating area to each of our CPS observations based on zip code. However, the CPS data does not include geographic information necessary to match to ACA rating areas. Instead, we match at the state-level, assigning the state's average premium to each CPS observation within that state.

To estimate expected out-of-pocket costs under the ACA, we need a distribution of medical care spending for the person to which the benefit provisions of Bronze or Silver coverage will be applied. After gaining insurance coverage, the distribution of spending use for the formerly uninsured may shift upward. Indeed, a major rationale for reform was to increase the consumption of care by low-income uninsured people. The new level of consumption may not match that of previous voluntary insurance purchasers, even after controlling for demographics, due to different preferences or tastes for medical care between former insurance purchasers and non-purchasers. For example, it is reasonable to believe that voluntary insurance purchasers facing market premiums at a given risk level likely have higher demands for care (conditional on insurance coverage) than those who must be subsidized or compelled to buy insurance. But because the ACA forbids most risk underwriting (except for location, age, and smoking), the uninsured population may have higher average risk than the insured population within each demographic cell even without moral hazard. On the other hand, if there was

[9] The results are not sensitive to weighting by the total population rather than the uninsured population.

previously adverse selection because of imperfect risk rating, the average uninsured health risk may be lower. And if the uninsured have low tastes for care, the risk of spending—which is what matters—may actually be lower for an uninsured person with health problems than for a healthy insured person.

We allow for variation in potential demand responses due to price, income effects, and shifts in risk by estimating out-of-pocket spending using two different distributions of total health spending from the MEPS. As a lower bound, we use the pre-ACA spending distribution of the uninsured, which assumes no demand response (17,977 observations). At the other extreme, we use the distribution of persons with full-year private insurance in either the individual or group markets (42,903 observations). This group spends more than double that of the uninsured, conditional on age, sex, and income.

In each scenario, we further split the distributions by sex, ages above and below 40, self-assessed health (fair or poor vs. good, very good, or excellent) and two income groups (above vs. below 250 percent FPL) for a total of 16 age/sex/income cells. Sample size limitations preclude forming distributions based on finer categories of age, income, and other factors. The choice of 16 age/sex/income cells balances the goal of predictive information about health expenditure against adequate cell sizes.

Based on the CPS sample, a sizeable fraction of the uninsured eligible for exchanges have incomes well in excess of the poverty line. The proportion of the uninsured eligible for exchanges with incomes above 175 percent of the poverty line is 80 percent, and the proportion with incomes above 250 percent of the poverty line is 48 percent.[10]

[10] As noted in the introduction, take up of coverage in the exchanges has been negatively and strongly related to income (Avalere 2015).

As described earlier, for each observation in the relevant MEPS subsample we calculate the (counterfactual) out-of-pocket payment that would result from applying representative cost sharing for Bronze and Silver plans to their observed spending. We assume Bronze plans have a deductible of $3,000 and coinsurance of 40 percent and that Silver plans have a $1,500 deductible and 20 percent coinsurance. Both plans have an OOP limit of $6,350.[11] Although specific benefit design information exists for each plan, the spending data is measured at aggregate levels not detailed enough in terms of service or timing to create valid counterfactual estimates, as data on individual insurance claims would permit.

We incorporate cost sharing subsidies that reduce out-of-pocket payments for Silver plans if the enrollee's income level is below 250 percent of the FPL. These subsidies take the form of reduced deductibles, coinsurance rates, and out-of-pocket maxima (see Appendix). For each MEPS observation, we apply the cost sharing subsidies applicable to that level of income when calculating out-of-pocket payments from total health spending. Very importantly, we also assume that the formerly uninsured who obtain coverage receive no charity care or bad debt adjustments to their cost sharing in the post-ACA period. The means of the simulated out-of-pocket payments for each of the demographic groups are then assigned to the corresponding CPS observations that match that age/sex/health status/income cell, weighting by the demographics of the CPS population within that particular cell.[12]

[11] These parameters are consistent with those computed by various actuarial firms for Bronze and Silver plans presented in Kaiser Family Foundation (2011) and meet the actuarial value regulations using the CCIIO calculator. The deductibles are lower (and coinsurance higher) than reports on the deductibles most popular in plans actually purchased.

[12] We adjust the mean out-of-pocket payment calculated from the MEPS according to the demographics in the CPS within cells to account for differences in the age and income distributions within cells between surveys. As an extreme example, if the CPS cell including ages below 40 includes 99 respondents aged 25 and 1 respondent aged 35, while the corresponding MEPS cells includes 99 respondents aged 35 and 1 respondent aged 25, we want to correct for this difference since spending is related to age.

B. Welfare Adjustments to Estimated Financial Impact

1. Risk aversion

Because the demand for insurance stems from risk aversion, it is important to consider the value of financial protection furnished by insurance. Given variability in the incidence and severity of illness, any person's observed out-of-pocket payment will likely differ from its expected value (or from the average out-of-pocket payment for a population with the same socio-demographic characteristics). We develop a measure of the variance of out-of-pocket spending about its conditional mean before and after reform as a measure of financial protection, and value any increased protection using Arrow-Pratt approximations of the risk premium assuming constant absolute risk aversion.[13]

Specifically, we calculate the variance of the difference between actual OOP and predicted OOP from a GLM regression controlling for age, sex, geographic region, income, years of education, survey year, race, smoking status, and prior diagnoses of chronic conditions. We include measures of prior health status because they may be associated with differences in expected out-of-pocket payments both while uninsured and with incomplete coverage in Bronze or Silver plans. The residuals from these regressions represent the unexplained portion of out-of-pocket costs that are uncertain from the consumer's perspective. As a measure of risk, we calculate the variances of the residuals under Bronze and Silver benefit designs described above for each of the 16 demographic groups from our spending distributions. In calculating OOP for

[13] Note that the distribution of out-of-pocket payment will be affected by moral hazard as well as by insurance coverage provisions. Other things equal, greater moral hazard will attenuate the financial value of insurance protection for persons whose insurance includes cost sharing by boosting both total care consumed and aggregate cost sharing for that care. If moral hazard is sufficiently high, financial risk may increase under insurance with cost sharing. For example, if lowering cost sharing from 50percent to 40 percent caused spending to increase from 100 to 130, out-of-pocket spending would increase from 50 to 52. Even with demand elasticity lower than unity, moral hazard attenuates the risk protection from greater insurance coverage.

those with incomes below 250 percent FPL, we incorporate cost sharing subsidies as shown in the Appendix.

The Arrow-Pratt risk premium approximation is $0.5\gamma\sigma^2$, where γ is the coefficient of absolute risk aversion and σ^2 is the variance of unexplained OOP.[14] The difference in variances pre- and post-ACA multiplied by 0.5γ thus yields the change in the risk premium, which will be positive if the variance of OOP decreases once insured. We focus on results using a coefficient of absolute risk aversion of 3×10^{-4} based on the insurance plan choice literature (Cohen and Einav 2007; Handel 2013; Handel and Kolstad 2015).[15] In robustness tests, we examine the sensitivity of our results to other assumed levels of risk aversion.

2. Value of additional health care

The second welfare adjustment reflects the value of additional care encouraged by insurance. We have already incorporated additional OOP from higher spending associated with providing coverage to the formerly uninsured. If there are no other impediments, and ignoring income effects, the value of this care to the insured must equal or exceed the price paid out-of-pocket, otherwise the care would not have been consumed (assuming informed consumers). But its value must fall short of the total cost of the incremental care (otherwise the care would have been consumed with no insurance), ignoring income effects. We assume that the value of the marginal dollar's worth of insured care to someone who obtains insurance with cost sharing c in the post-ACA period is $\$c$. But what was the marginal value of a dollar's worth of care not

[14] This formula for the Arrow-Pratt approximation assumes risk is additively separable from wealth. The approximation is accurate only for small risks or special cases such as CARA utility with normally distributed risks.
[15] At this level of risk aversion, a consumer with CARA utility $U(x) = -\exp(-\gamma x)/\gamma$ would be indifferent between accepting or rejecting a bet that offered a 50-50 chance to win $1,000 or lose $768. As another example, a consumer with CARA utility and this level of risk aversion who faces a 20 percent chance of suffering a $1,000 loss would be willing to pay a risk premium of $225 to fully insure the prospective loss.

covered by insurance in the pre-ACA period? If there were no charity or bad debt care it would be worth $1. Assuming a linear demand curve, the value of the additional care would then be (0.5) (1 - *c*) times the increment in spending. We use this value in our empirical estimates.

What is the effect of charity or bad debt care that reduced the cost of care to uninsured people below its price? We can use the MEPS data to calculate the ratio *r* of out-of-pocket payments to estimated total cost of care for the uninsured. That ratio is less than one for all income categories (though it is higher for higher income uninsured) because of charity care and bad debt. If the uninsured were able to adjust quantities, taking *r* into account, the starting point marginal value would be $*r* and the change in cost sharing would be (*r* - *c*)—so the value of additional care would be lower than described in the previous paragraph. Since one of the purposes of charity care for donors was presumably to increase access and use of care by the uninsured to higher levels than they would have chosen facing the full price, we would expect some increase. But it may be that there were some (more) strict limits on care for the uninsured. This would be especially likely for bad debt, but could even characterize charity care if donors were more interested in alleviating the financial burden on the uninsured than in expanding volume. Hence we do not add a further downward adjustment to the value of care in our empirical estimates, but note that they could represent an overvaluation of the benefits from additional use from the direct consumer's perspective.

Figure 1 illustrates. We assume away income effects in this example, so that the demand curve for a representative uninsured person D_U also reflects that persons' marginal benefit from care. The coinsurance rate after the person buys coverage is *c*, and the person is able to obtain the quantity he or she would demand at that price Q_I. If in contrast the person were both uninsured and had to pay the full price of care, the quantity would be Q_U. But if the person

received charity care that reduced the marginal price per dollar of care to *r*, he or she would demand Q_R.

The two potential measures of the value of any additional care obtained by the formerly uninsured person are: (1) the area under the demand curve from Q_R to Q_I; or (2) the area under the demand curve from Q_U to Q_I. The latter amount would correspond to the limiting case in which donors (or debt forgiveness) held the increase in use in the pre-reform case to zero.

In summary: to estimate the value of the additional care caused by the presence of insurance coverage, we need to consider the effective marginal price before the ACA and the effective marginal price after the ACA given the choice of some particular ACA "metallic" tier of coverage. If the marginal price before the ACA were 100 percent of the cost or price, then the value of increased use is $0.5(P - cP)DQ$, where *c* is the post ACA coinsurance rate and *DQ* is the increase in use associated with it. But if the effective coinsurance rate before reform was less than unity (because of charity care), then the value may be as low as *r*, so the calculation would be $0.5(rP - cP)DQ$.

We provide one additional calculation corresponding to a "best-case" scenario in terms of the benefit furnished by insurance. One might assume that, because of imperfect information and other impediments, the additional care used had a higher value than implied by the previous discussion. There are some estimates that the additional use of care for the formerly uninsured might yield health benefits so large that it is cost effective (Miller, Vigdor, and Manning 2004). In the "best-case" scenario, we assume that incremental care had value equal to its cost in calculating welfare changes from insurance. We also use a higher level of risk aversion of 0.001 to calculate the risk reduction benefits from ACA coverage in this scenario.

IV. RESULTS

The CPS and MEPS data indicate that the uninsured spent relatively modest amounts out-of-pocket, on average, prior to the ACA. The mean OOP for the MEPS data shown in Table 1 is $409 (which is slightly higher than for the CPS). The data strongly suggest that the non-poor uninsured received costly care for which they did not pay, even at relatively high income levels. The difference between the "cost of care" the uninsured received (shown as total spending pre-ACA) and what they paid (OOP pre-ACA) is usually attributed to charity care and bad debt. The actuarial value of the implicit insurance that the uninsured received (at zero premiums), i.e., the fraction of total care not paid by the uninsured varies little across income groups, and averages about 75 percent—more generous than a Bronze plan and similar to that for a Silver plan.[16]

Gross and net premiums for Silver and Bronze plans are presented in the remaining columns of Table 1. The gross premiums differ by income only due to differences in the age distribution within each income stratum. Gross premiums on average are substantially higher than pre-ACA expected out-of-pocket payments for all income strata. Even with premium tax credits, Silver premiums are more than twice the level of expected pre-ACA OOP, even for those between 138 and 175 percent of FPL who receive large premium subsidies. On average for the full sample of formerly uninsureds, the net Silver premium of $2,458 is more than five times larger than pre-ACA OOP. The minimum premium Bronze plan has an average annual net premium of $1,541 across income groups. Applying the tax credit to lowest cost Bronze plans allows those at lower incomes to purchase coverage at very low prices. Individuals between 138 and 175 percent FPL would pay an average of just over $21 per month ($261 annually) for the minimum premium Bronze plan. But for all other income groups and for all other coverage

[16] Specifically, the actuarial value is calculated as 1– *r*, where *r* is the ratio of total OOP summed across consumers to total spending summed across consumers. We use both OOP and total spending from the MEPS for consistency.

options, the post-ACA premiums alone exceed the average out-of-pocket payment while uninsured. So even if we assumed that post-ACA insurance eliminated out of pocket payments, the average uninsured person will suffer a financial loss because he or she will pay more in premiums than their expected payments when uninsured.

Table 2 presents estimated expected OOP in Bronze and Silver plans, again displaying pre-ACA OOP while uninsured for comparison. For both metallic levels, we present estimates for the two spending distributions used to simulate OOP in the post-ACA period: (1) original uninsured spending (implying no moral hazard); and (2) spending for persons insured in the individual market. For the uninsured with low incomes, estimated out-of-pocket spending is moderately reduced in Silver plans due to cost sharing subsidies if the spending distribution remains the same as without insurance, whereas the higher-income uninsured consistently have higher out-of-pocket spending even after obtaining coverage. With Bronze coverage, average OOP increases because cost-sharing subsidies are only available with Silver plans and the implicit actuarial value (as a proportion of total spending) from bad debt and charity care while uninsured was well above the 60 percent benchmark for Bronze coverage.

Table 3 shows that the sum of premiums and out-of-pocket payments (TEP) substantially exceeds the amounts paid while uninsured, even at lowest income levels. For all of the reasons just discussed, those receiving low or zero subsidies from the ACA pay more on average than they did in the pre-ACA period. But even these lower income people receiving significant premium and cost sharing subsidies end up paying more than before the ACA, largely because the ACA subsidies fall short of the implied subsidy provided by charity and bad debt care in the pre-ACA period.

As shown in Table 4, Panel A, ACA-approved coverage often does reduce the standard deviation of out-of-pocket spending for Silver plans, (while potentially increasing the mean value). However, the variability of OOP spending increases at all income levels for Bronze plans. The cap on out-of-pocket payments and Silver plan cost sharing subsidies drive the reductions in risk for Silver plans. On average, the standard deviation for OOP in Silver plans falls even though mean spending rises with the privately insured distribution due to better coverage.

Panel B of Table 4 translates the change in variances (pre minus post) into a change in the risk premium, so that positive numbers indicate a fall in the risk premium after the ACA, representing greater financial protection. The large reductions in OOP risk for Silver plans translate into reduced risk premiums compared to pre-ACA OOP (Panel B of Table 4). In contrast, although Bronze plans cap out-of-pocket payments, the relatively low variability in pre-ACA OOP results in small increases in the risk premium from pre-ACA levels to post-ACA levels using the spending distribution of the previously uninsured. The increases in risk premiums for Bronze plans based on individually insured spending are greater, indicating less risk protection benefits in Bronze plans compared with charity and bad debt care in the pre-ACA period.

Estimates of total medical care spending and the value of the increased care consumed due to insurance are presented in Table 5. The estimated values of increased care are between $2,064 and $2,760 using the conventional approximation to measuring the welfare cost of moral hazard, which assumes the marginal value of care is half its cost. The estimated benefits for Bronze coverage are modestly larger than for Silver coverage because the consumer pays higher

out-of-pocket prices under Bronze plans and thus less of total spending is counted as deadweight loss compared to Silver plans (with total spending assumed to be constant).

The total welfare change from obtaining coverage is calculated by subtracting the benefits from insurance from the additional amounts paid for insurance and care. Specifically, the difference in the risk premium and value of increased care consumed represent the benefits from insurance, while the difference in the sum of premium and average OOP (post minus pre) represents the price paid.

Table 6 presents estimates of welfare change by income group if all (or a random sample) of that group were to obtain coverage. Average welfare for the uninsured population would be estimated to decline after the ACA if all members of that population obtained coverage. The fall in welfare is roughly the same amounts on average for Bronze and Silver plans. At the lowest income stratum and under the assumption that spending increases, there are welfare gains because of subsidies and increased access. Those at all higher-income levels, a majority of the uninsured eligible for exchanges, suffer welfare losses that increase with income because subsidies diminish and then disappear.

To examine the sensitivity of our results to health risk, the risk aversion parameter, and the value of additional consumption, we also provide estimates for subpopulations at various risk levels and for the entire population using a risk aversion coefficient of 0.001 and an assumption that the value of all additional care is equal to the amount of spending. Table 7 shows the distribution of welfare changes for subpopulations based on health risk. As expected, higher risk groups that will benefit from community rating will sometimes be better off because they benefit from substantially increased care but their specific premiums do not reflect that higher use. Table 8 in contrast shows the "best-case" scenario in terms of the benefits furnished by insurance

for the population of formerly uninsured.[17] Persons between 138 and 175 percent of FPL on average are now substantially better off with Silver and Bronze coverage using the distribution of privately insured spending but face welfare losses under the previously uninsured spending distribution. The estimates still indicate welfare declines for higher-income groups, with the estimated losses ranging up to several thousand dollars.

To summarize, we consistently find that the previously uninsured with incomes above 250 percent of FPL would on average experience welfare declines with Silver or Bronze coverage. Tables 9 and 10 provide estimates of takeup rates calculated by subtracting from any welfare loss the penalty associated with the individual mandate as well as the explicit subsidies. Not unexpectedly, predicted takeup rates are high among high risks but low among the more numerous low and average risks even in the optimistic best case scenario. Estimated takeup rates are close to those observed in the insurance exchanges (Avalere 2015).

V. CONCLUSION

Our estimates indicate that the majority of the previously uninsured would be subject to substantial negative financial impacts by purchasing insurance on exchanges in response to the ACA. Impacts on welfare are less stark, with potential gains at low income and high risk levels. However, many of the non-poor formerly uninsured are estimated to be worse off because the subsidies are not large enough and coverage not generous enough to offset their new obligation to pay part of the premium along with required cost sharing. This loss contributes to the relatively low estimated takeup rates to date for exchange coverage for persons who do not qualify for large premium subsidies and cost sharing subsidies. The result is driven by the

[17] We do not provide estimates based on the lower value of additional care discussed earlier in the paper, where the uninsured adjusted their use based on lower marginal out-of-pocket prices due to charity care.

uninsured paying a small fraction of their costs prior to the ACA, and this empirical pattern also explains the low estimated value of providing Medicaid to the uninsured in recent work by Finkelstein, Hendren, and Luttmer (2015).

To be sure, benefits from ACA coverage include better protection against very large and unexpected out-of-pocket payments, and access to additional care which provides some health and consumption benefits. Even if a formerly uninsured person is made worse off, the rest of the community may gain from the now "responsible" behavior. It will be important to examine the level and pattern of these increased financial burdens to judge whether they are of sufficient social value to justify their imposition.

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Figure 1. Valuation of additional consumption from lower prices due to insurance coverage

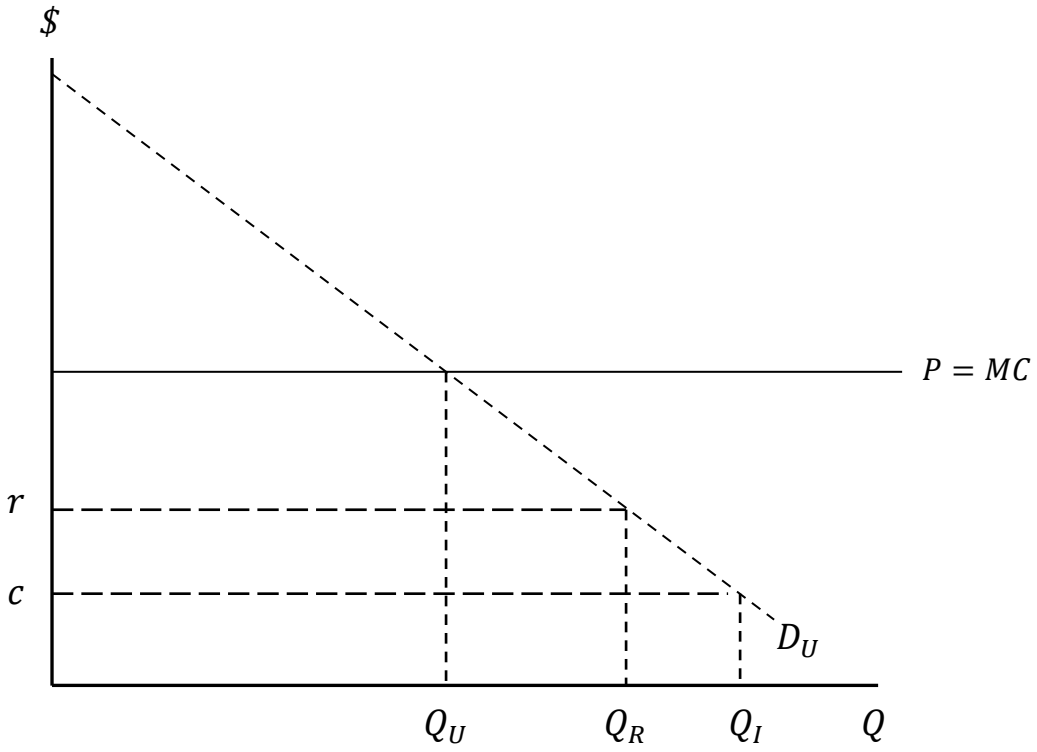

Table 1. Average annual pre-ACA OOP and post-ACA premiums for alternative spending distributions ($)

Income group (%FPL)	OOP pre-ACA	Total spending pre-ACA	Gross Silver premium (2nd lowest)	Tax credit	Net Silver premium (2nd lowest)	Gross Bronze premium (lowest)	Net Bronze premium (lowest)
138 – 175 (N = 1,515)	373	1,624	3,794	2,735	1,059	2,857	261
175 – 250 (N = 2,390)	351	1,510	3,739	1,923	1,816	2,812	910
250 – 325 (N = 1,518)	462	1,978	3,787	880	2,907	2,847	1,967
325 – 400 (N = 763)	457	1,976	3,943	587	3,356	2,961	2,374
>400 (N = 1,333)	461	1,975	4,033	0	4,033	3,030	3,030
Total (N = 7,519)	409	1,761	3,836	1,378	2,458	2,885	1,541

Table 2. Average annual out-of-pocket payments for alternative spending distributions ($)

Income group (%FPL)	Pre-ACA OOP	Silver		Bronze	
		Previous uninsured spending	Privately insured spending	Previous uninsured spending	Privately insured spending
138 – 175	373	357	1,032	784	1,909
175 – 250	351	340	1,004	745	1,851
250 – 325	462	691	1,613	965	2,271
325 – 400	457	683	1,602	952	2,257
>400	461	686	1,603	957	2,259
Total	409	513	1,304	857	2,064

Note: The first column presents estimated OOP paid by the uninsured before the ACA using data from the MEPS. The remaining columns estimate OOP under Silver and Bronze plans assuming different distributions of total spending as described in the text using data from MEPS.

Table 3. Average annual total expected price (TEP) for alternative spending distributions ($)

Income group (%FPL)	Pre-ACA	Silver		Bronze	
		Previous uninsured spending	Privately insured spending	Previous uninsured spending	Privately insured spending
138 – 175	373	1,416	2,091	1,045	2,170
175 – 250	351	2,156	2,820	1,655	2,761
250 – 325	462	3,598	4,520	2,932	4,238
325 – 400	457	4,039	4,958	3,326	4,631
>400	461	4,720	5,636	3,987	5,289
Total	409	2,971	3,762	2,398	3,605

Note: The first column presents estimated OOP paid by the uninsured before the ACA. The remaining columns present the sum of premiums and expected OOP payments under Silver and Bronze plans assuming different distributions of total spending as described in the text using data from MEPS.

Table 4. Standard deviation of unpredictable OOP and risk premiums for alternative spending distributions ($)

A. Standard deviation of unpredictable OOP

Income group (%FPL)	Pre-ACA OOP	Silver		Bronze	
		Previous uninsured spending	Privately insured spending	Previous uninsured spending	Privately insured spending
138 – 175	1,242	500	704	1,345	1,869
175 – 250	1,214	490	697	1,317	1,854
250 – 325	1,270	1,012	1,404	1,416	1,881
325 – 400	1,266	1,009	1,401	1,411	1,879
>400	1,280	1,004	1,383	1,406	1,867
Total	1,248	745	1,040	1,369	1,867

B. Change in Risk premiums (pre- minus post ACA Arrow-Pratt approximations)

Income group (%FPL)	Silver		Bronze	
	Previous uninsured spending	Privately insured spending	Previous uninsured spending	Privately insured spending
138 – 175	229	193	-16	-262
175 – 250	217	181	-16	-266
250 – 325	123	-20	-29	-252
325 – 400	118	-24	-31	-256
>400	128	-9	-22	-242
Total	174	87	-21	-257

Note: Panel A presents the standard deviation from the residual of a GLM regression of out-of-pocket spending against a cubic in age interacted with sex, cubic in income as a percentage of the FPL, indicators for year, race, MSA or non-MSA area, four Census regions, and income levels. Panel B reports the difference in variances of unexplained OOP multiplied by one-half the coefficient of absolute risk aversion of 0.0003. This estimate of the change in risk premiums represents the value of differences in risk protection after the ACA.

Table 5. Average annual total spending and value of additional care or alternative spending distributions ($)

Income group (%FPL)	Total Spending		Value of Increased Care Consumed	
			Silver	Bronze
	Previous uninsured spending	Privately insured spending	Privately insured spending	Privately insured spending
138 – 175	1,605	5,321	2,064	2,601
175 – 250	1,499	5,061	2,171	2,493
250 – 325	1,979	5,922	2,563	2,760
325 – 400	1,966	5,908	2,562	2,759
>400	1,960	5,885	2,551	2,747
Total	1,750	5,525	2,339	2,643

Note: The value of additional care equals one-half of the change in total spending for the respective distribution of spending.

Table 6. Average change in welfare by income for alternative spending distributions ($)

Income group (%FPL)	Silver		Bronze	
	Previous uninsured spending	Privately insured spending	Previous uninsured spending	Privately insured spending
138 – 175	-814	539	-688	543
175 – 250	-1,588	-117	-1,320	-184
250 – 325	-3,014	-1,516	-2,499	-1,268
325 – 400	-3,464	-1,963	-2,901	-1,672
>400	-4,131	-2,633	-3,548	-2,323
Total	-2,388	-928	-2,010	-810

Note: The change in welfare is calculated assuming a coefficient of absolute risk aversion γ equal to 0.0003 and that the value of additional care equals one-half the change in total spending. All changes are significantly different from zero at the 0.01 level based on tests from running an OLS regression of welfare change for each observation against indicator variables, clustering by age-state pairs.

Table 7. Average change in welfare by health status and income for alternative spending distributions ($):

	Silver		Bronze	
Self-assessed health	Previous uninsured spending	Privately insured spending	Previous uninsured spending	Privately insured spending
Fair or Poor	-2,038	728	-1,961	791
Good, Very Good, Excellent	-2,421	-1,083	-2,015	-960
		Fair or Poor health		
Income group (%FPL)				
138 – 175	-387	2,219	-815	2,027
175 – 250	-1,235	1,434	-1,316	1,179
250 – 325	-2,743	235*	-2,340	621
325 – 400	-3,336	-651	-2,856	-247*
>400	-4,551	-1,536	-4,040	-1,062
		Good, Very Good, or Excellent health		
Income group (%FPL)				
138 – 175	-863	346	-673	372
175 – 250	-1,621	-262	-1,321	-311
250 – 325	-3,039	-1,676	-2,513	-1,441
325 – 400	-3,477	-2,098	-2,905	-1,818
>400	-4,101	-2,710	-3,513	-2,411

Note: The change in welfare is calculated assuming a coefficient of absolute risk aversion γ equal to 0.0003 and that the value of additional care equals one-half the change in total spending.. * Change not statistically different from zero at the 0.1 level. All changes are significantly different from zero at the 0.01 level based on tests from running an OLS regression of welfare change for each observation against indicator variables, clustering by age-state pairs.

Table 8. Average change in welfare under "Best-case" scenario for alternative spending distributions ($):

	Silver		Bronze	
Income group (%FPL)	Previous uninsured spending	Individually insured spending	Previous uninsured spending	Individually insured spending
138 – 175	-279	2,642	-725	1,046
175 – 250	-1,081	1,695	-1,358	263
250 – 325	-2,728	-183	-2,565	-674
325 – 400	-3,188	-640	-2,973	-1,087
>400	-3,832	-1,279	-3,598	-1,709
Total	-1,982	712	-2,060	-277

Note: The welfare estimates in this table assume a coefficient of absolute risk aversion $\gamma = 0.001$ and the value of additional care equals its cost. All changes are significantly different from zero at the 0.01 level based on tests from running an OLS regression of welfare change for each observation against indicator variables, clustering by age-state pairs.

Table 9. Predicted take-up rates by income for alternative spending distributions ($)

					"Best case" scenario			
	Previous uninsured spending		Privately insured spending		Previous uninsured spending		Privately insured spending	
Income group	Silver	Bronze	Silver	Bronze	Silver	Bronze	Silver	Bronze
138 – 175	8%	0%	75%	77%	26%	16%	100%	74%
175 – 250	0%	0%	46%	49%	16%	5%	90%	57%
250 – 325	0%	1%	7%	13%	2%	1%	53%	37%
325 – 400	1%	1%	3%	8%	1%	1%	38%	25%
>400	1%	1%	5%	5%	1%	1%	34%	21%
Total	2%	0%	32%	35%	11%	5%	69%	46%

Note: For the base scenario (columns 1-4), the coefficient of absolute risk aversion γequals 0.0003 and the value of additional care is assumed to equal one-half its cost. For the "Best-case" scenarios, risk aversion $\gamma = 0.001$ and value of additional care equals its cost.

Table 10. Predicted take-up rates by income and health status

	Previous uninsured spending		Privately insured spending		"Best case" scenario: Previous uninsured spending		"Best case" scenario: Privately insured spending	
	Silver	Bronze	Silver	Bronze	Silver	Bronze	Silver	Bronze
Health status								
Fair or Poor	17%	4%	69%	73%	40%	26%	89%	79%
Good, Very Good, or Excellent	1%	0%	29%	32%	8%	3%	67%	43%
				Fair or Poor health				
Income group (%FPL)								
138 – 175	53%	0%	92%	91%	76%	44%	100%	86%
175 – 250	3%	0%	76%	75%	49%	30%	100%	76%
250 – 325	6%	7%	80%	81%	21%	17%	81%	81%
325 – 400	8%	8%	31%	70%	8%	10%	73%	73%
>400	12%	12%	29%	32%	12%	12%	68%	75%
				Good, Very Good, or Excellent health				
Income group (%FPL)								
138 – 175	3%	0%	73%	76%	20%	13%	100%	73%
175 – 250	0%	0%	43%	47%	13%	2%	89%	55%
250 – 325	0%	0%	0%	7%	0%	0%	51%	33%
325 – 400	0%	0%	0%	1%	0%	0%	35%	21%
>400	1%	1%	4%	3%	1%	1%	31%	17%

Note: For the base scenarios (Columns 1-4), the coefficient of absolute risk aversion γ equals 0.0003 and value of additional care equals one-half its cost. For the "Best-case" scenarios (Columns 5-8), risk aversion $\gamma = 0.001$ and value of additional care equals its cost.

Appendix

Schedule of Premium and Cost Sharing Subsidies

Income group (%FPL)	AGI from CPS uninsured sample ($)	Premium subsidy: Max % income on premium	Cost sharing subsidy: Max deductible	Cost sharing subsidy: Max coinsurance	Cost sharing subsidy: Max OOP limit
138 – 150	18,513	4.0	0	0.15	1000
150 – 200	24,363	6.3	400	0.15	2000
200 – 250	33,080	8.0	1500	0.2	2,250
250 – 400	42,005	9.5	No subsidy	No subsidy	No subsidy
>400	80,448	No subsidy	No subsidy	No subsidy	No subsidy