Journal of Public Economics 96 (2012) 520–523

Contents lists available at SciVerse ScienceDirect

Journal of Public Economics

journal homepage: www.elsevier.com/locate/jpube

A welfare measure of "offset effects" in health insurance

Jacob Glazer [a,b], Thomas G. McGuire [c,*]

[a] Tel Aviv University, Israel
[b] Boston University, United States
[c] Department of Health Care Policy, Harvard Medical School, United States

ARTICLE INFO

Article history:
Received 20 October 2010
Received in revised form 8 February 2012
Accepted 20 February 2012
Available online 26 February 2012

Keywords:
Health insurance design
Offset effects

ABSTRACT

Changing health insurance coverage for one service may affect use of other insured services. When improving coverage for one service reduces use of another, the savings are referred to as "offset effects." For example, costs of better coverage for prescription drugs may be partly "offset" by reductions in hospital costs. Offset effects have welfare implications but it has not been clear how to value these impacts in design of health insurance. We show that plan-paid – rather than total – spending is the right welfare measure of the offset effect, and go on to develop a "sufficient statistic" for evaluating the welfare effects of change in coverage in the presence of multiple goods. We derive a simple rule for when a coverage improvement increases welfare due to offset effects.

1. Introduction

Health insurance coverage for one good or service can affect the quantity demanded of other goods or services in a health plan. Following an improvement in coverage for one good, a reduction in the quantity demanded of other services or goods is referred to as an offset effect. A large empirical literature in health economics and health services research, focusing on coverage for drugs, finds offset effects, and measures these effects by the change in total spending on the other covered goods. For example, Shang and Goldman (2007) use Medicare Current Beneficiary Survey (MCBS) data from 1992 to 2000 to show that the extra spending on drugs induced by medigap coverage is more than offset by reductions in total health care spending on other services. Hsu et al. (2006) compare medical spending for Medicare beneficiaries with a cap on drug coverage to spending by those without a cap at Kaiser Permanente of Northern California prior to Medicare Part D. Drug spending was 28% less in the capped group but other categories of expenditures were higher and total spending for all care was not significantly different between the groups, implying a near dollar-for-dollar offset in total costs. Gaynor et al. (2007) study the effect of increases in copayments charged for drugs among private employees on total (plan plus consumer) spending. Increases in non-drug spending, largely in outpatient care, offset $.35 of each dollar saved in drug costs.[1] Chandra et al. (2010) found that the savings in costs due to higher copayments for drugs were partly offset by higher spending on hospital services among retired state employees in California. They tracked offsets by payer since a primary (Medicare) and secondary (employer-provided supplemental) shared in offsets unequally.

The implicit logic in offset papers is that if total medical costs fall due to an increase in coverage, then the change in coverage is welfare improving (i.e. "pays for itself"). This paper argues that change in total medical spending, meaning the sum of plan and patient out-of-pocket spending, is not the right measure of the economic value (or cost) of a change in insurance coverage due to offset effects. Rather, health plan costs alone measure the economic value of savings due to reductions in the use of other services. Applying methods reviewed by Chetty (2009), we show that a "sufficient statistic" for evaluating the welfare effect of change in coverage for one good is

[1] Other papers use total costs as the measure of offsets. Gibson et al. (2006) measured the effects of lower copayments for statins (drugs treating high cholesterol) on total medical expenditures, payments from any source, and evidence of an offset. Zhang et al. (2009) found an offset effect in added drug coverage for Medicare Part D. In their group with no prior drug coverage, drug spending went up $41 per person per month with Part D but other medical expenses fell by $33 per month. They computed the offset effect of Medicare Part D on other medical expenditures using total expenditures (plan plus copayments). Lichtenberg (2007) has conducted a series of studies of the health and medical care cost impacts of newer prescription drugs and found evidence for an offset effect on total health care costs. For a recent paper, see Lichtenberg (2007). Zhang and Soumerai (2007) question the conclusions of some of Lichtenberg's earlier offset findings. Offset effects of drugs have become so widely accepted that "null effect" papers are published. See Duggan (2005) who pursued the Lichtenberg line of inquiry for a specific area of treatment and found that newer antipsychotic drugs did not reduce total costs in comparison to older drugs. See also Zhang (2008).

* Corresponding author. Tel.: +1 617 432 3536; fax: +1 617 432 2905.
E-mail address: mcguire@hcp.med.harvard.edu (T.G. McGuire).

0047-2727/$ – see front matter © 2012 Elsevier B.V. All rights reserved.
doi:10.1016/j.jpubeco.2012.02.007

the change in total plan-paid costs less the change in costs transferred to/from consumers.[2] We go on to derive an elasticity rule for when the offset effects of an improvement in coverage increase welfare.

A simple argument shows why total costs are not the right welfare measure of an offset effect. Suppose the plan covers just one service, "health care," and an increase in coverage of health care increases a consumer's total expenditures on health care. The consumer budget constraint implies that spending on some other non-covered services has to fall. This "offset" says nothing about efficiency since coverage expansions are always exactly "offset" in this trivial sense. What if the affected other spending were on another form of health care that was minimally covered in the plan, say for one percent of costs with consumers paying ninety nine percent? Logically, token coverage cannot imply that we should count the full spending change as an offset.

To see the intuition for our result about the role of plan-paid costs consider the following example. Suppose that there are two services and both are (partially) covered by insurance, namely the individual has to pay some copayment lower than the marginal cost of providing the services. What is the effect of a change in the level of copayment of one of the two services on welfare? Since the level of services the individual chooses to use is at the point where his marginal benefit equals the copayment, and since the copayment is less than marginal cost, there is a welfare loss associated with the consumption of the two services. The change in welfare loss is just the sum of the changes in consumption times the difference between marginal cost and marginal benefit for each of the two services. Note that the difference between marginal benefit and marginal cost is equal to the plan's share of costs. Our focus on plan-paid cost is due to this: plan paid costs are a measure of the welfare loss per unit, and total welfare effect of a change in the offset good's consumption is the change in quantity multiplied by the plan paid share of costs.

2. A model of offsets in health insurance

Suppose a health plan covers services 1 and 2. Quantity of each received by a representative individual in the plan is x_1 and x_2 measured in dollars. Benefits to the individual are $B(x_1,x_2)$, where $B_i \geq 0$, $B_{ii}<0$, $i=1,2$, with subscripts indicating partial derivatives. Letting c_i denote the copayment charged for each unit of service i, then the individual demands service i to satisfy:

$$B_i(x_1,x_2) = c_i \quad i = 1,2 \tag{1}$$

Let R denote the plan premium paid by the enrollee. Assuming the plan makes zero profit, the premium is:

$$R(c_1,c_2) = (1-c_1)x_1 + (1-c_2)x_2, \tag{2}$$

where (x_1,x_2) are given by Eq. (1).

The individual's total utility from the plan is thus:

$$U(c_1,c_2) = B(x_1,x_2) - c_1x_1 - c_2x_2 - R(c_1,c_2), \tag{3}$$

where (x_1,x_2) are from Eq. (1) and R is from Eq. (2). Substituting for R to recognize that the individual pays for services by a combination of the cost sharing and the premium:

$$U(c_1,c_2) = B(x_1,x_2) - x_1 - x_2. \tag{3'}$$

Consider now what happens to utility (welfare) (Eq. (3′)) if the plan were to change the copayment for service 2:

$$\begin{aligned}\frac{\partial U(c_1,c_2)}{\partial c_2} &= (B_1-1)\frac{\partial x_1}{\partial c_2} + (B_2-1)\frac{\partial x_2}{\partial c_2} \\ &= (c_1-1)\frac{\partial x_1}{\partial c_2} + (c_2-1)\frac{\partial x_2}{\partial c_2}\end{aligned} \tag{4}$$

The second equality follows from Eq. (1). Suppose copayment for service 2 is reduced. If $\frac{\partial x_1}{\partial c_2} > 0$, there is an offset effect and consumption of x_1 falls with this change. What happens to welfare? Eq. (4) tells us how to value the offset. Reversing the sign of Eq. (4) to get an expression in terms of plan shares, when copayment for service 2 goes up (down), utility of the individual goes up (down) if and only if Eq. (5) holds:

$$\underbrace{\left[(1-c_1)\frac{\partial x_1}{\partial c_2}\right]}_{\text{Offset effect}} + \underbrace{\left[(1-c_2)\frac{\partial x_2}{\partial c_2}\right]}_{\text{Own-price effect}} < 0 \tag{5}$$

The intuition for this result is the following: the second term on the left-hand side of the inequality captures the inefficiency in consumption induced by the reduction in copayment for service 2. With health insurance, the marginal benefit of health care is less than the marginal cost ($B_2 = c_2 < 1$), and the extra consumption of x_2 due to the reduction in copay creates additional welfare loss.[3] The first term on the left-hand side in Eq. (5) is the offset effect due to the change in consumption (in this case reduction) of x_1. Just as with the own-price effect, benefits and costs both matter in valuing welfare of any offset effect. The $1\frac{\partial x_1}{\partial c_2}$ part is the reduction in total cost from the change in x_1 and, since $B_1 = c_1$, the $-c_1\frac{\partial x_1}{\partial c_2}$ part is the loss in benefits. Thus, the net welfare measure of offset effects is plan savings: $(1-c_1)\frac{\partial x_1}{\partial c_2}$.

We can relate the analysis to changes in plan's costs. From Eq. (2) we know that when copayment for service 2 changes, the change in the plan's costs is given by:

$$\frac{\partial R(c_1,c_2)}{\partial c_2} = (1-c_1)\frac{\partial x_1}{\partial c_2} + (1-c_2)\frac{\partial x_2}{\partial c_2} - x_2 \tag{6}$$

Expression Eq. (4) for welfare and Eq. (6) for plan costs are the same except for the presence of x_2, the cost shifting effect of a change in c_2, a transfer ultimately paid by the consumer in any case. Using Eqs. (4) and (6) we can state a rule for welfare in terms of plan-paid costs.

2.1. Rule for welfare effects

The welfare effect of a change in coverage is equal to minus the change in plan costs net of the cost-shifting effect of the coverage change.

Proof. From Eqs. (4) and (6) we get:

$$\frac{\partial U(c_1,c_2)}{\partial c_2} = -\frac{\partial R(c_1,c_2)}{\partial c_2} - x_2 \tag{7}$$

[2] Chetty (2009) uses the term as follows. A statistic, e.g., the decline in plan-paid costs, is "sufficient" for welfare analysis in the sense that conditional on this information, no other statistics from the data are informative about welfare. An exact measure of welfare is obviously a sufficient statistic.

[3] In the conventional analysis of optimal health insurance, this welfare loss is weighted against the risk spreading gain to find the optimal copayment, c_2 (Zeckhauser 1970). We return to the issue of risk below.