Chapters 7 and 9:
THE DEMAND FOR HEALTH CAPITAL

1. Conceptual Framework

Grossman adapted human capital theory to explain the demand for health and health care. His theory demonstrates how health demand is different from other goods:

1. Not medical care per se that consumers want but health

2. The consumer does not passively purchase health but produces it - medical care demand is a derived demand for an input to produce health itself. People want health and they demand medical care to produce it (along with lots of other things)

3. Health last for more than one period. It is a durable good. Thus it is a time allocation problem.

4. The demand for health has two aspects:
    1. Pure consumption aspect - health is desired because it makes people feel better
    2. Pure investment aspect - health is desired because it increases the number of health days available to work and thus increases income.

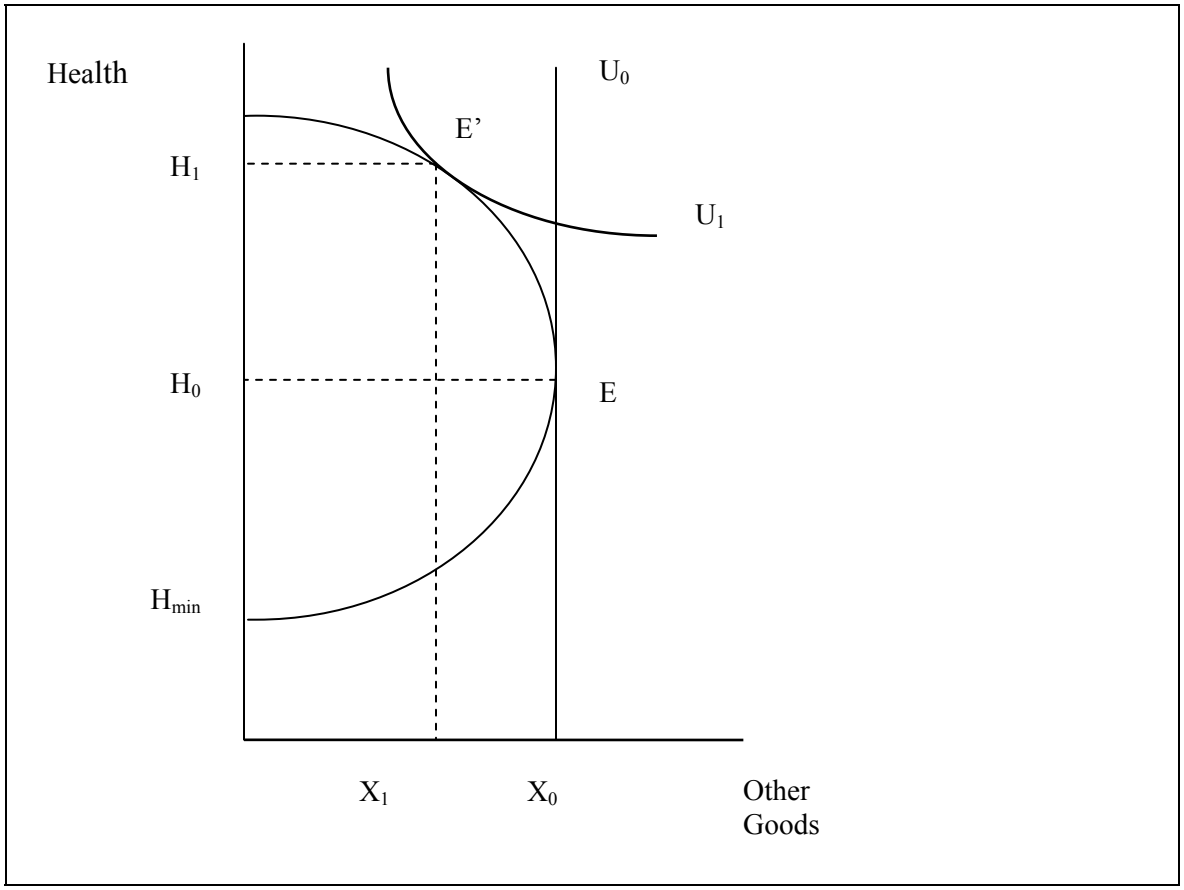
5. The Demand for health is uncertain. The idea is that unlike other goods, we really do not know what our demand will be like in the future. This adds to the mix, because we need to allow this uncertainty or risk to affect preferences. This gives rise to the market for health insurance, and also leads to many of the problems in health care markets.

First we will deal with demand with certainty to see how the consumer choice model plays in here, and then we will add the complication of uncertainty later.

2. The production of health

Now lets talk more about how health is produced. Consider the following production possibility frontier for an individual consumer

The Production Possibility Frontier



Note that it is shaped a little differently than from what you've seen earlier.

1. H_{min} – need at least this much to live
2. Upward sloping between H_{min} and E Initially improvements in health also increase consumption of the other good. This reflects the investment effect. Once past point E though, additional increases to health come at the cost of reduced consumption of the other good.

If the consumer only puts value on health to the extent it allows him/her to consume other goods (health in and of itself does not provide utility) then the indifference curve will be shaped as in U_0 and the equilibrium will be at point E, with X_0 of the other good and H_0 in health. But if the consumer placed some consumption value directly on health (it feels good to feel good!), then the indifference curves might be shaped something like U_1 Then we'd get some additional investment in health beyond H_0 to H_1.

3. Investment over time and the demand for health capital.

We demand health capital because it helps us earn more and it makes us feel good, but we also have to worry about what it costs. The process here is similar to a firm investing in a piece of equipment.

Suppose an x-ray machine costs $100,000, and that the annual contribution to the use of the machine is $20,000. Is purchasing this machine a good investment? We need to consider the opportunity cost of the $100,000 investment – say you put that money in a savings account and earn 5% per year:

100,000 x 1.05 = 105,000 at the end of year 1
105,000 x 1.05 = 110,250 at the end of year 2

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121,551 x1.05 = 127,629 at the end of year 5.

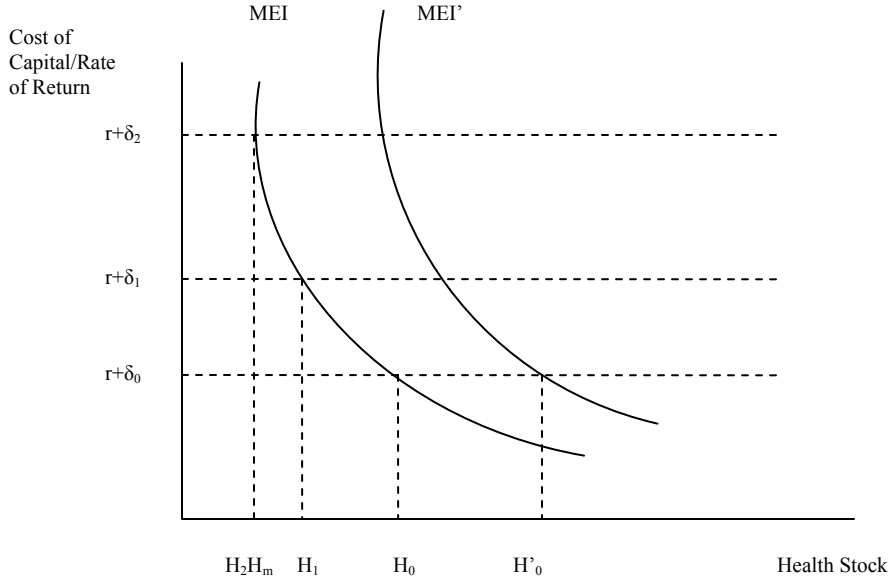
So for the investment in the x-ray machine to be desirable it should produce at least 27,629 in incremental income over the five years.

We also have to worry about how the machine depreciates over time. In the above example if the machine does not depreciate at all, at the end of 5 years, it will have paid off the 100k, and be worth 100k, etc. the higher the depreciation rate of the machine the less attractive the investment will be all things equal.

So if the clinic knows that the machine will wear out, so that it will be worth only half its original value in five years, the clinic must earn enough not only to cover the opportunity cost from the bank but also to maintain the value of the machine. So the machine must earn enough to cover the 5% return but also enough to cover depreciation. So the cost of holding a capital good for one year is the opportunity cost of the capital plus the depreciation.

A similar logic applies to investment in health capital – though the numbers are tough to come up with. The cost of health capital can be measured (or thought of) in terms of foregone resources. An another concept is the marginal efficiency of capital – this measures the return to the investment. To see the MEI concept think about the x-ray machine some more. The firm may find it useful to add on machine, but it may want to add even more. But they would consider these in sequence.

The first machine may yield 20k per year or 20k/100k=.20, a 20% return. The management would buy this machine if the incremental revenue covered the opportunity cost of capital and the depreciation. So as long as the interest rate plus depreciation rate is less than 20% they'd do it. For the second machine, presumably the rate of return would be lower than 20%. Then future machines would have declining returns. So they'd continue to invest in additional machines as long as the rate of return was greater than the interest rate plus depreciation and stop when they were equal.



The Curve MEI shows the various rates of return for increasing levels of investment. The fact that it is downward sloping reflects the diminishing marginal rate of return. So for a given interest rate+δ you would go to the MEI to figure the best level of investment. So if the cost of capital was at $r+\delta_1$ then you'd go to H_1 level of health stock.

Note that this graph shows similar information to the production possibilities/utility curve shown above, what this gives us though is that it explicitly shows the time component of the investment. In the PPC graph one can think about the other good as being the opportunity cost of capital, etc. but it is easier to see the investment here.

Changes in equilibrium

1. Age.

The assumption here is that the lifespan of the individual is endogenous – that is the consumer has some power over the length of his/her lifespan. According to this model the consumer will at some time optimally allow his/her health stock to dissipate to H_{min}. This depends on the way the depreciation rate varies with age and how long the person expects to live (and enjoy the benefits of good health). Think of it as the "natural aging process". Note that this will be different for different people, should decline over time for everyone.

In terms of depreciation, we might expect the depreciation rate to decrease with age – so not only do we fall apart over time, but we do so at an increasing rate. So as δ increases the optimal health stock decreases.

Note that since the amount of capital supplied to the elderly by a given amount of gross investment also decreases, we would expect to see the elderly invest more medical care, even as their health stock decreases.

Thinking about it from the investment side, note that we'd expect to see more investment in health for younger than older individuals – simply because there is more time to see a return on any given investment.

So from a pure investment perspective we expect that optimal health will decline as the person ages. If we now allow a consumption effect (good health is desirable because it makes me feel good). Things might change if people put a higher premium (get more utility) from feeling good as they age. If people increase their valuation of health then this will tend to offset the negative effect predicted by the investment piece.

2. Wages

Suppose an individual's wage rate increases. How would this affect things? Note that increasing the wage rate increases the returns obtained from healthy days – so higher wages imply a higher MEI curve, so in the graph above it shifts from MEI to MEI', and for any given $r+\delta$ the individual will increase his/her optimal capital stock. The rewards for being healthy are higher for higher-wage workers so higher wage workers will want higher levels of health capital stock.

However, note that there is an opposite effect at work. A higher wage implies an increased opportunity cost of time in producing health investments. Thus the MEI could shift inward and so it is possible that the equilibrium demand for health investment will fall. A workaholic?

3. Education

The effects of education on health have been discussed – there is a positive correlation though the causation is unclear. Here we focus on the direct effect. Education could improve the efficiency with which one can produce investments in health – can follow directions, better knowledge of unhealthy behaviors, learn to be more forward looking. This would result in a shift outward in the MEI curve. Since education increases the marginal product of the direct inputs it reduces the quantity of these inputs required to produce a given amount of gross investment. Note that this is a supply side explanation – increased education increases the efficiency of production.

There is also likely to be a demand response. First from the consumption side educated people are likely to recognize the benefits of improved health. They might enjoy eating nutritious food more and doing exercise since they have a better understanding of the good. Likewise on the investment side in order for the higher education to pay off the consumer must remain healthy enough to maximize the return on that investment. Thus the decision to invest in education is also likely to correspond with a decision to invest in health.

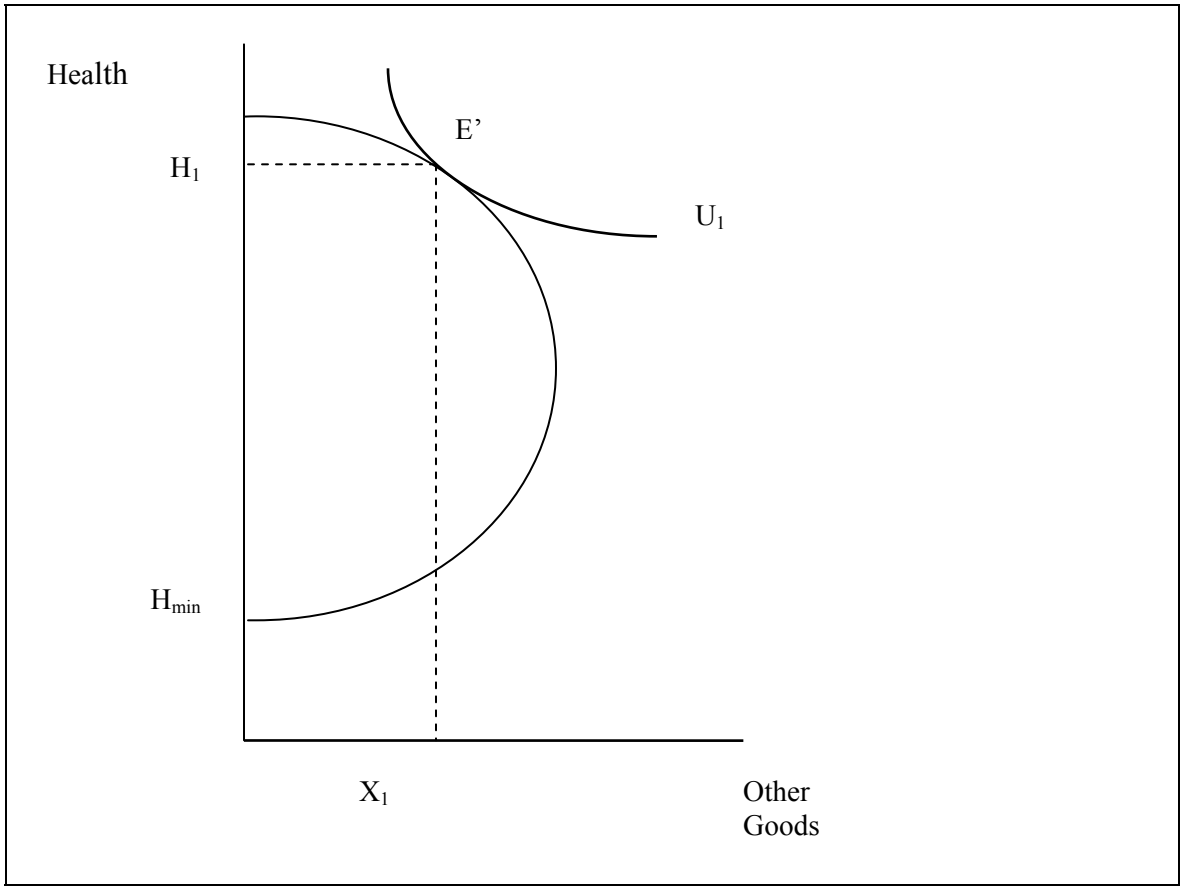
Note that the predictions here are that more educated individuals will have higher levels of health, likewise higher earners are likely to also invest in more health capital and therefore be in better health. This is based on efficiency, not fairness though and, therefore, from society's perspective this could come across as unfair or unequal. The assumption here, though is that people are maximizing their utility by investing in less healthy activities. Note the implication would be that from a policy perspective forcing these people to act more healthy would make them worse off. It would be better to alter their incentives to invest in healthy behavior (if this is a desirable goal) by increasing their education.

Rational addiction can be thought of as the extreme case of this.

Chapter 9
THE DEMAND FOR HEALTHCARE.

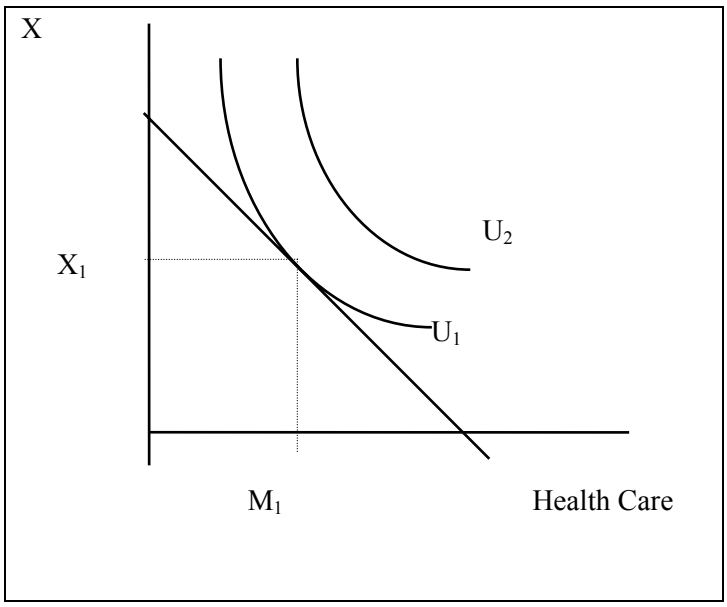
In this chapter we want to go from the production of health decision to the demand for health care. We will then use that to describe how the demand for insurance affects that demand and how markets have attempted to alleviate that problem.

Recall the production possibilities graph:



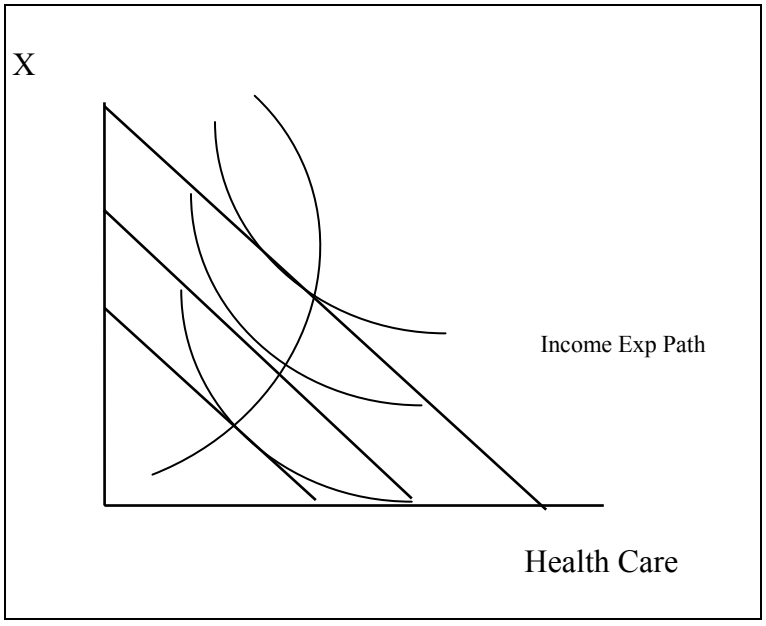
This yields some optimal level of health, H_1. Once this is chosen the consumer must "produce" this amount of health by using, among other inputs, health care.

The PPF shows feasible sets of X and health that we can attain (as individuals) given our production process and our budget and the utility derived from various combinations of X and H. Underlying this is some production process one of the inputs into this is health care. Thus we can derive a similar graph for X and health care that looks more familiar to us.



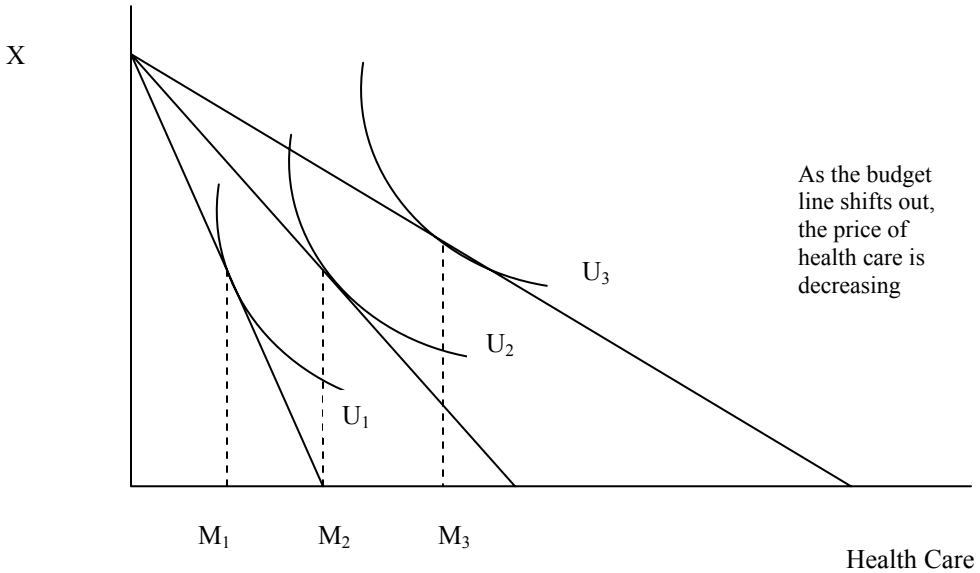
Here the budget line shows the affordable possibilities for the consumer to spend his/hear income between X and health care (say visits to the doctor). The shape of the indifference curve here is determined by the patients willingness to trade off x for visits to the doctor (which is determined by her/his ability to produce health with these visits). The equilibrium level of health, H_1, corresponds to the equilibrium level of health care, M_1, in this graph.

What happens as income increases?

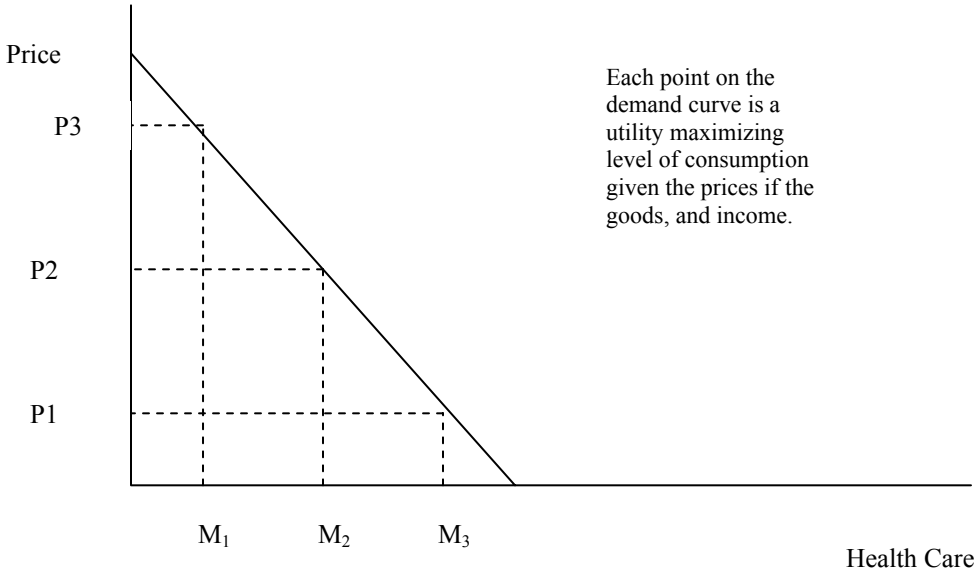


Sanitation Effect - initially
Health Spa effect - increased income results in a change in lifestyle - can afford to pamper yourself
Life in the fast lane - increased risk taking - driving bungee jumping etc.

The demand for health care is from this utility maximization problem. How does the optimal level of health care demanded change as the price of health care changes?.

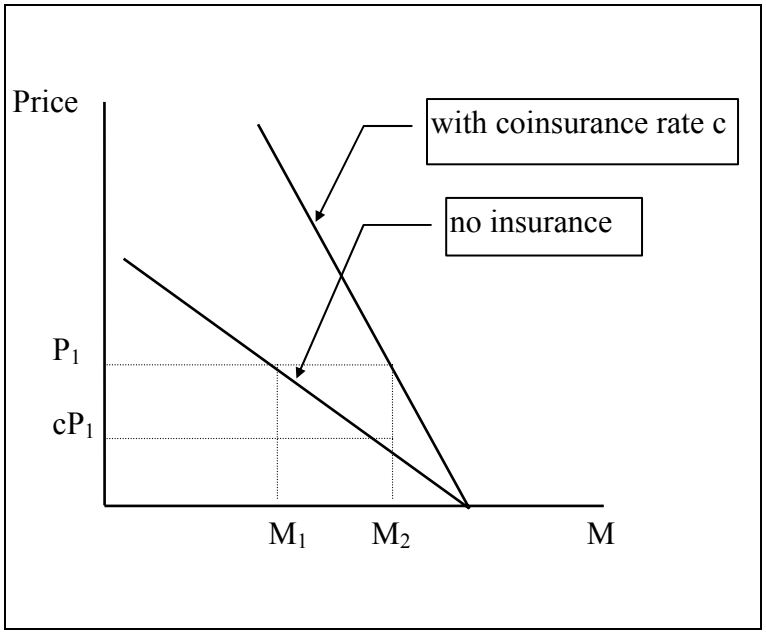


The demand for Health Care"



Coinsurance
Often consumers are covered by health insurance. Typically coinsurance refers to the percentage paid by the patient while co-payment refers to the amount paid by the patient.

Individual effect

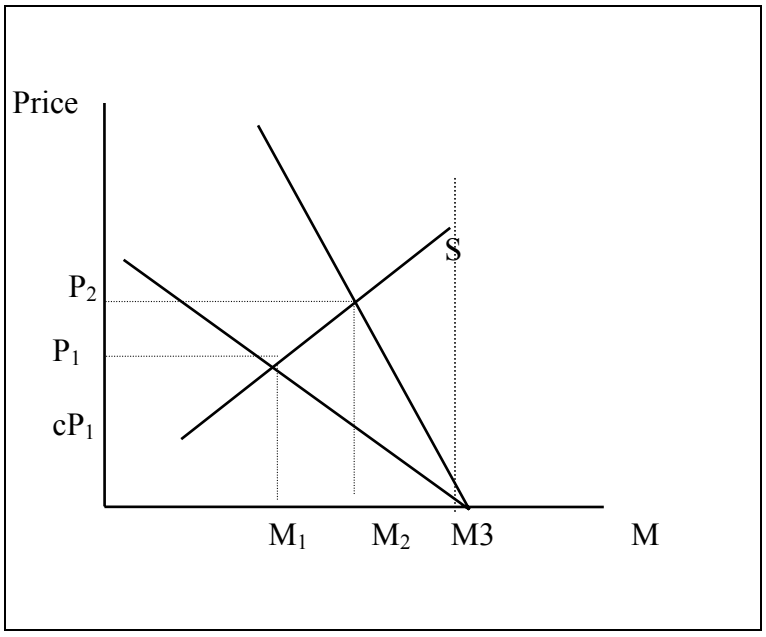


With insurance the demand becomes more elastic

Without insurance, if the price was P_1 then consumers would demand M_1. But with insurance they consume M_2. It is as if the price fell to cP_1.

The more generous coverage (or the lower the coinsurance rate) the steeper the demand curve become until it becomes vertical at c=0. Critical feature here is that coinsurance makes the demand less elastic.

Note the effect on the market



The effect of insurance on the market is to rotate out the demand. Assuming an upward sloping then that increases Medicare care from m1 to m2 and increases price to p2. Thus expenditures in health care increase from p1*m1 to P2*m2. This is a major factor in the increase in medical expenditures over the last 40 years. At least according to some.

This response to the economic incentives is termed ***Moral Hazard*** – the increased usage of services when the pooling of risks leads to decreased marginal costs for the services. It is also

used to refer to the change in behavior that may occur when risk is reduced – driving more dangerously because of insurance and seat belts, FDIC.

Note that the more inelastic the demand for health is the less this loss will be. Also the use of coinsurance rates reduces this. Note that in the absence of c the consumption would be M3.

See "The Moral Hazard Myth" from the New Yorker Magazine.

4. Empirical measurements of demand elasticities

A. Price Elasticities most estimates are inelastic when they look at market elasticity. These tend to be estimated in the -.05 to -.2 range for hospital services
-.15 to -.3 for physician visits.

Pretty inelastic.

However when *Firm Elasticity* is considered we get a different story:

Physician Services using physician price or visits: -3.0 to -5.7
Hospital services patient days or admissions: -.74 to -.80

Note the contrast = suggests that market for physicians is quite competitive while there is considerable market power in the market for hospital services.

B. Income Elasticities : Generally quite small, but positive. More income causes a slight increase in health care.