

Asymmetric Information: Theory Overview

Amy Finkelstein

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Rationales for social insurance

1. Private market failures
 - 1.1 Imperfect competition [go take IO]
 - 1.2 **Asymmetric Information**
 - 1.3 Aggregate Shocks
 - 1.4 Externalities
2. [Already covered] Redistribution
3. Individual failures of rationality / optimization
4. Paternalism

Asymmetric Information

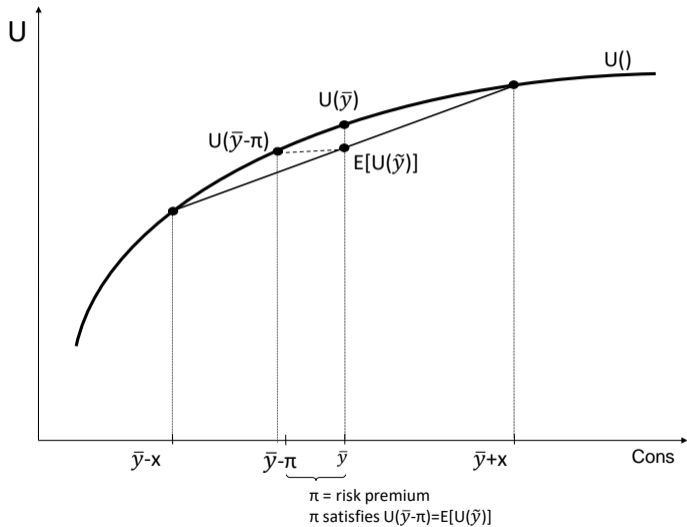
- Adverse selection (hidden types)
 - Individuals have private information about their costs to insurer
 - Can impair efficient operation of market and create scope for welfare improving public policy
- Moral hazard (hidden actions)
 - Individuals take hidden actions in response to insurance contract
 - Prevents attainment of first best insurance policy
 - In general not something the government has a comparative advantage in addressing.
 - Critical though for optimal design of insurance (public or private)
 - Tradeoff between insurance (risk spreading) and incentives (moral hazard)

- Present simple theoretical frameworks for
 - Adverse selection
 - Moral hazard
- Goals
 - Conceptual clarity
 - Framework for empirical work (coming next)

The problem of adverse selection: under-insurance

- Recall “free lunch” appeal of insurance:
 - Insurance transfers resources for states of the world with low marginal utility of consumption to high marginal utility of consumption
 - Goal: equation (“smooth”) marginal utility of consumption across states of the world
 - By pooling idiosyncratic risk, can make everyone better off
 - Prefer to pay \$10 for sure than face a one in ten thousand risk of having to pay \$100,000
- But this pooling mechanism may not work if individuals have private information about risk type
 - Risk type: chance become sick, lose job, die etc
 - High risk come into the market and drive up prices for low risk
 - Possible result: no one buys insurance even, *even though each person’s benefit from insurance exceeds cost of providing it to that person*
 - Suggests possible welfare-improving role for mandates

Insurance: A Free Lunch!



Adverse selection

- Key points
 - Welfare gain to risk averse individuals from being able to buy actuarially fair insurance
 - Market failure: because private information about risk type, may not be able to buy actuarially fair insurance
 - Potential scope for welfare improving government intervention
- Classic theory: Akerlof (1970); Rothschild and Stiglitz (1976)
 - Framework we (and others) use for empirical work follows Akerlof (1970)

Simplified graphical theoretical framework

- Sketch a simplified graphical theoretical framework
 - To illustrate under-insurance and welfare loss that can arise with private information about risk type
 - To illustrate tradeoffs involved with potential government interventions (e.g. mandates)
- Up next: Take framework to data to:
 - Test for existence of adverse selection
 - Quantify resultant welfare loss
 - Assess welfare consequences of alternative policy interventions
- Overview follows Einav and Finkelstein (JEP 2011)

A comment on applications

- Model is abstract but often helpful to discuss by way of a specific application
- Will use (intentionally and sometimes unintentionally!) health insurance to fix ideas
- Many recent empirical applications to other insurance markets including
 - flood insurance (Wagner 2020)
 - worker's compensation insurance (Cabral et al. 2022)
 - unemployment insurance (Landais et al 2020)
- Applications to credit markets too (mortgages, student loans, personal loans etc).
 - Stiglitz and Weiss (1981) is theoretical analog of Akerlof

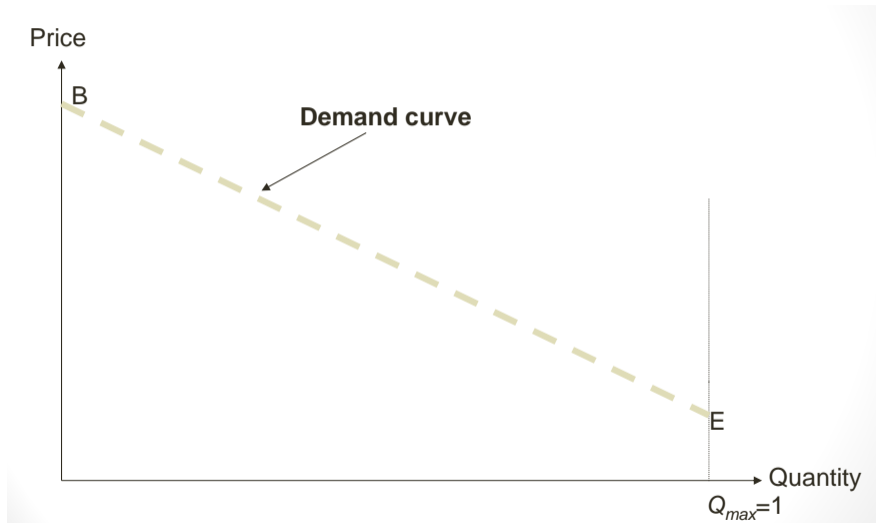
Setup - Textbook case

- Perfectly competitive, risk neutral firms offer a single health insurance product that covers you if you get sick
 - Consumer choice: buy or not buy the contract
 - Important assumption: insurance product taken as given (standard demand /supply of a "good")
 - "fixing contract space"
 - Akerlof (fixed) vs. Rothschild and Stiglitz (not fixed)
- Risk averse individuals identical except for their (privately known) probability of getting sick
 - NB: in practice, heterogeneity in preferences (as well as risk).
 - Will relax....
- No additional frictions (e.g. administrative costs)
 - so firms' (and social) costs of providing insurance are expected insurance claims, that is expected payouts on policies
 - Will also relax...

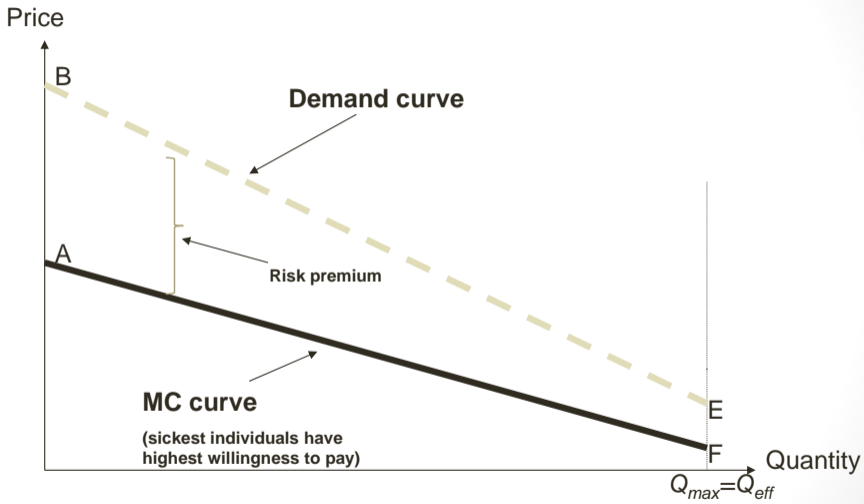
Setup (con't)

- Marginal cost: expected insurance claim of the marginal (at that price) buyer
- Given this setup, what drives demand?
 - {Note: unit demand. so "quantity" is share of population who purchases}
 - Because individuals identical except for probability of getting sick, individuals with higher probability of getting sick have higher demand (wtp) for insurance
- Key Implication: downward sloping marginal cost curve
 - Individuals with highest willingness to pay have highest expected costs
 - Link between demand and cost curve is distinguishing feature of selection markets: production costs depend on which consumers purchase your product

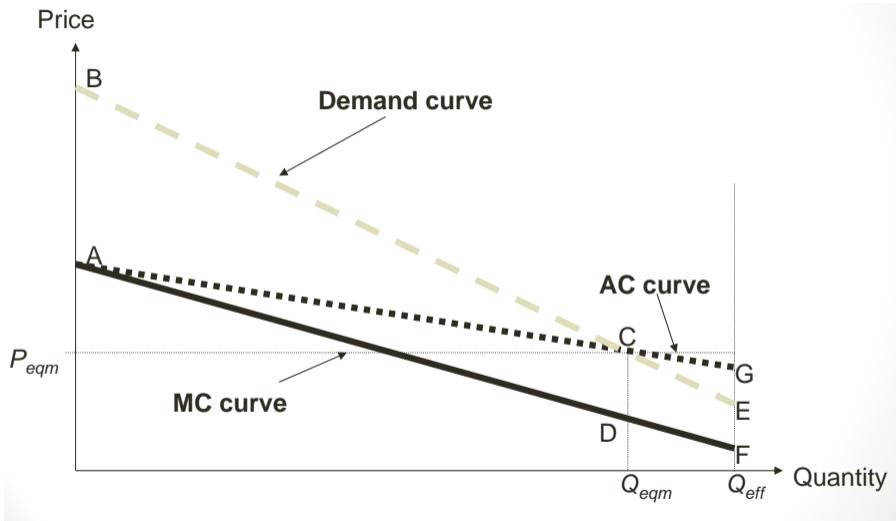
Adverse selection: under-insurance



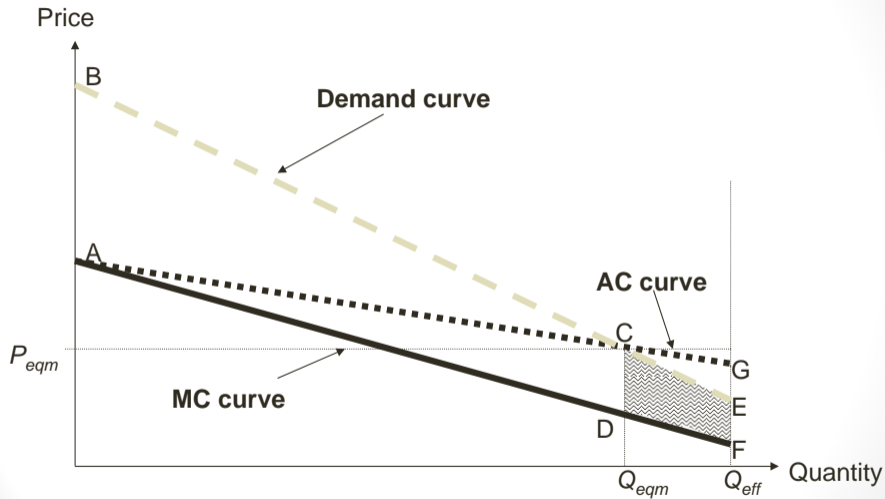
Adverse selection: under-insurance



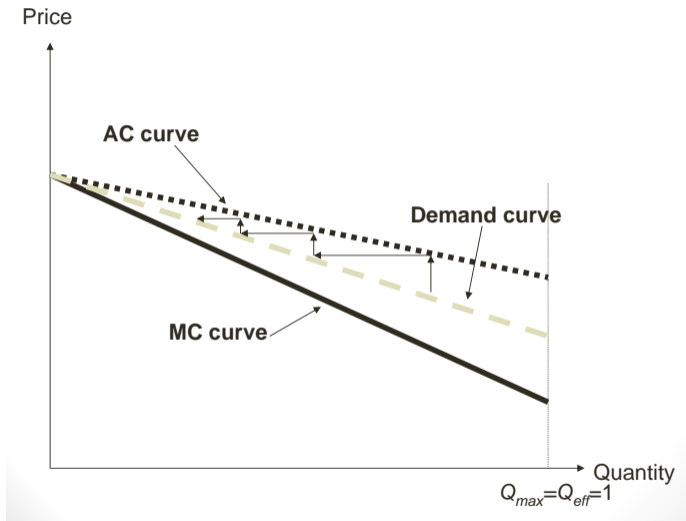
Adverse selection: under-insurance



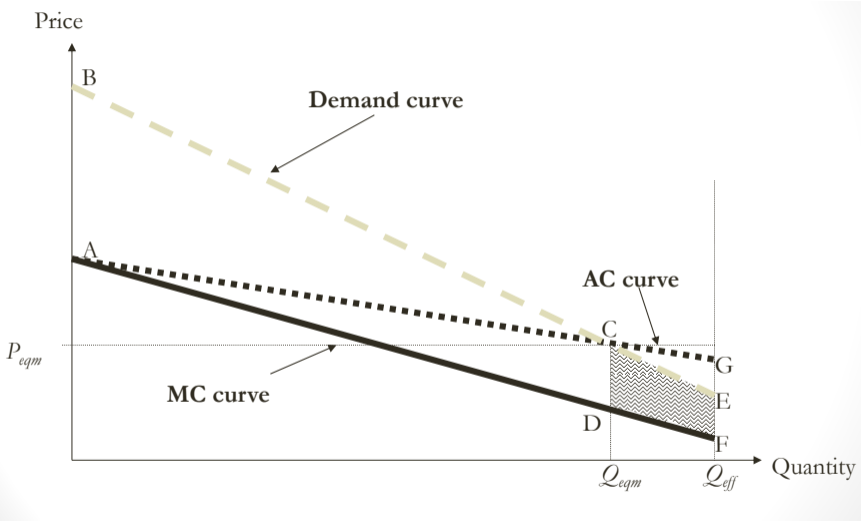
Adverse selection: under-insurance



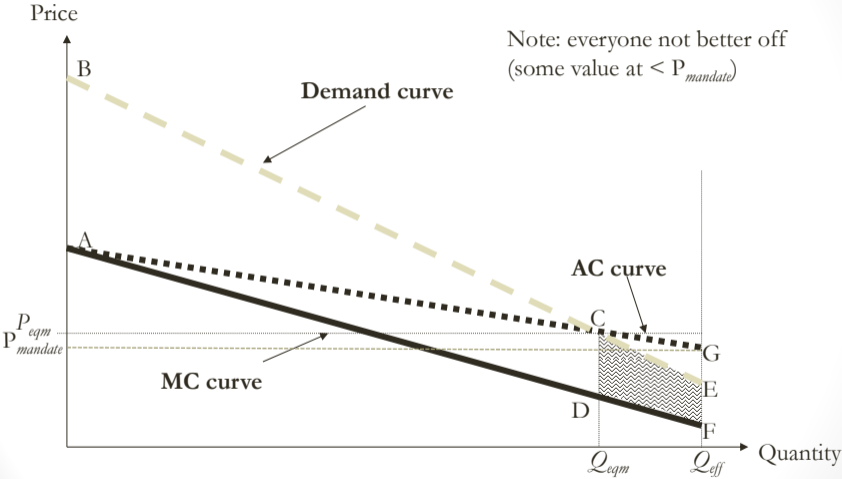
Can get complete unraveling



Mandates as possible solution



Mandates as possible solution



Potential public policy solutions

- Assume government has no better information than firm
- Comparative advantage of government is to manipulate price (tax/subsidies) or manipulate quantity (mandate)
- Subsidize insurance
 - Unambiguous welfare gain (until you consider the cost of public funds or fiscal externalities of the policy)
- Mandate coverage
 - Can achieve efficient outcome (mandate $Q_{mandate} = Q_{max} = Q_{eff}$)
 - Unambiguous welfare gain; magnitude uncertain
 - Note: *No Pareto Improvement* - some will be made worse off by mandate
 - Useful in understanding '08 Obama-Clinton primary debates...
 - But also model specific (e.g. potential Pareto improving policies in Rothschild-Stiglitz)

Public Policies (Con't)

- Common policies: restrictions on price differentiation
 - e.g. no pricing on age and gender
 - extreme: "community rating"
- Tradeoff
 - Adverse Selection vs. Reclassification Risk (Handel, Hendel, Whinston EMA 2015)
 - "Reclassification risk" (aka "premium risk") = risk of becoming a bad risk and therefore paying a lot more in premiums
 - Insurance behind the veil of ignorance (Hendren 2021: Measuring Ex-Ante Welfare)

Comment: pricing on Xs

- Note: Pricing on X's does not necessarily reduce welfare cost of adverse selection
- Imagine segment market (price on) gender
 - Now have two distinct insurance markets to analyze / two graphs (one for each market)
- If pricing on gender removes all residual private information (i.e. gender-specific MC curves are flat) then unambiguously welfare improving
- Otherwise ambiguous
 - is sum of area two welfare loss triangles (for men and women) bigger or smaller than area of triangle in gender-pooled market?

Comment: pricing on Xs (con't)

- Example with three types:
 - Type 1 (10% of population) has expected cost of 20 and wtp 30
 - Type 2 (60% of population) has expected cost of 5 and wtp 20
 - Type 3 (30% of population) has expected cost of 4 and wtp 7.5
- Competitive (zero-profit price): is 6.2 and everyone buys insurance (efficient)
- If type 2 individuals are all female and type 1 and 3 are all male and price on gender
 - women are all insured (price of 5) - efficient
 - men: pooled competitive price is 8 at which point type 3 would inefficiently not buy insurance

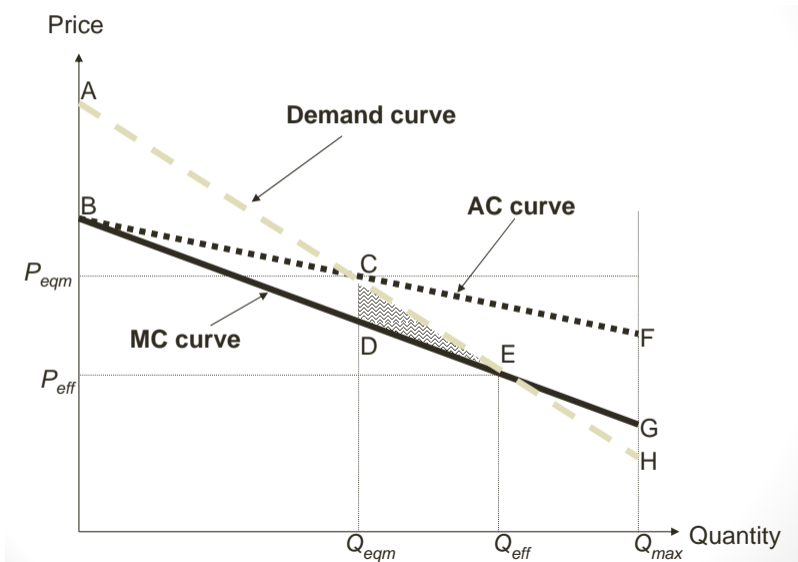
Comment: pricing on Xs (con't)

- Real world application: Medicare Advantage introduced finer risk adjustment (i.e. pricing insurance on more Xs)
 - From just demographics to also using health conditions
 - Not clear that reduced advantageous selection ("cream skimming") into this market (Brown et al. 2014 "vs." McWilliams et al. 2012)
- Key conceptual point: reducing but not eliminating a friction is not always welfare improving
 - Creates important opportunities for empirical work!
- If interested in more see e.g.
 - Veiga (2025 ReStat) on theory
 - Nelson (2025 EMA) on empirical application (2009 CARD act limited lenders ability to raise interest rates based on new information about borrower)

Departure from textbook case I: Loads

- Why might it not be efficient to insure everyone (i.e. why might MC be above WTP for some individuals?) Assuming everyone is risk averse...
 - Loading factors on insurance (administrative costs)
 - [Profits – not yet introduced in model]
 - Horizontal product differentiation (HMO vs PPO trades off lower oop costs but with more restrictions on doctor's choice)
 - [Moral hazard - not yet introduced in model]
- With these, everyone may not value insurance at $>$ MC of providing it to them
- What if it is not efficient for everyone to buy insurance?
 - No longer unambiguous welfare gain from mandate
 - Tradeoff between two allocative inefficiencies: under-insurance from adverse selection vs. over-insurance from mandate
 - And this is still without allowing for preference heterogeneity! That introduces further sources of ambiguity...

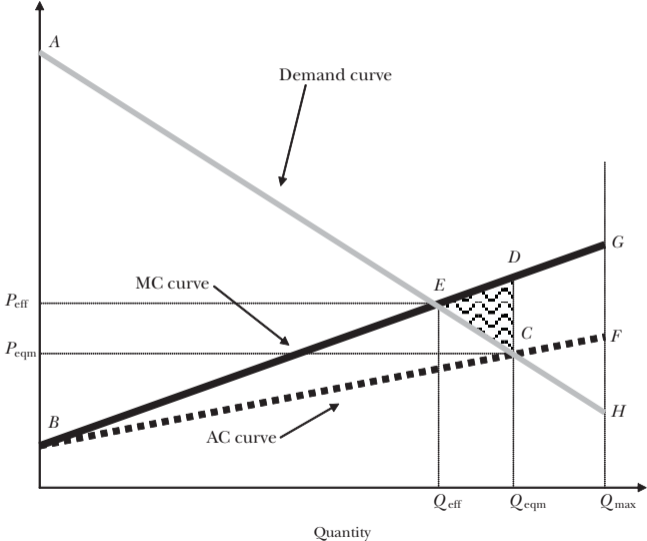
Adverse selection with loads



Departure from textbook case II: Preference heterogeneity

- Individuals may differ not only in their risk type but also their preferences (e.g. risk aversion / willingness to bear risk)
 - WTP increasing in risk aversion and in risk
- Creates potential for *advantageous* selection (opposite results of *adverse* selection)
- If high-risk individuals are less risk averse and heterogeneity in risk aversion is large, can get upward sloping marginal (and therefore average) cost curve
 - Individuals with highest WTP are the most risk averse and lowest (vs. highest) expected cost

Advantageous selection



Advantageous selection

- Over-insurance
 - Opposite problem from adverse selection
- Opposite policy solutions
 - e.g. tax (vs. subsidize) insurance

Ultimately these are empirical questions (to be covered in next few lectures)

- Does adverse selection exist?
 - i.e. is marginal cost curve downward sloping? As you raise the price, is the marginal guy who drops out lower risk than the average guy who remains?
- How large is the welfare loss from adverse selection?
- What are the net welfare effects of various government interventions

- Present simple theoretical frameworks for
 - Adverse selection [done]
 - Moral hazard

Moral hazard

- Unobserved effort taken by agent in response to insurance contract that affects expected claims
- For example, in response to more (vs less) comprehensive...
 - automobile insurance - drive more or less safely
 - unemployment insurance - exert less effort searching for a job, set higher reservation wage
 - health insurance - eat more cheeseburgers, don't search for cheaper doctor
- Drives wedge between private and social cost
- Classic tradeoff of insurance vs. incentives
- Cost of insurance (not of social insurance / govt intervention)

Simple model of moral hazard

- Application: unemployment insurance
 - Pays out when you become unemployed
 - highly simplified, static model (see Chetty (2006) for richer model(s))
- The model
 - utility from consumption: additively separable and risk averse: $u(c)$
 - immediately: probability p of becoming unemployed
 - regains employment with probability q at cost $h(q)$
 - income while employed: $w - \tau$
 - income when unemployed: b
 - {simplify: assumed taxes paid only by employed, not by reemployed}
- government {or insurer} budget constraint requires:

$$p(1 - q)b = (1 - p)\tau$$

First best

- Suppose can control q (e.g. monitor search effort perfectly).
- Set benefits (b), taxes (τ) and reemployment probability (i.e. effort) q to maximize utility subject to the government break even constraint (benefits financed by tax)
- Solve:

$$\max_{q,b,t} \{(1 - \rho)u(w - \tau) + \rho[(1 - q)u(b) + qu(w) - h(q)]\}$$

subject to

$$\rho(1 - q)b \leq (1 - \rho)\tau$$

First best (con't)

- Solve:

$$\max_{q,b,t} \{(1-p)u(w-\tau) + p[(1-q)u(b) + qu(w) - h(q)]\}$$

subject to

$$p(1-q)b \leq (1-p)\tau$$

- First order conditions:

$$\{\tau\}: (1-p)u'(w-\tau) = \lambda(1-p)$$

$$\{b\}: p(1-q)u'(b) = \lambda p(1-q)$$

$$\{q\}: h'(q) = u(w) - u(b) + \lambda(b)$$

First best (con't)

- Interpretation
 - FOC for q : $\{q\}$: $h'(q) = u(w) - u(b) + \lambda(b)$
 - internalizes fiscal cost of benefit b . i.e. equates marginal cost of q with marginal benefit which is the private benefit (difference in utility between re-employment and unemployment) and the public benefit (the fiscal cost of the benefit)
 - We get "full insurance": marginal utility of consumption equated across states ("consumption smoothing"):

$$u'(w - \tau) = u'(b) \quad (1)$$

(note: here we can't do anything about the fact that consumption is not equalized with the reemployment state, due to our simplifying assumption)

Worker private optimization problem

- Key: social planner can't choose q, b, τ . Can set parameters of social insurance (b, t) but then worker privately optimizes / chooses q
- Worker optimization:

$$V(b, \tau) = \max_q \{ (1 - p)u(w - \tau) + p(1 - q)u(b) + pq u(w) - ph(q) \}$$

- optimum yields $q^*(b)$ with first order condition

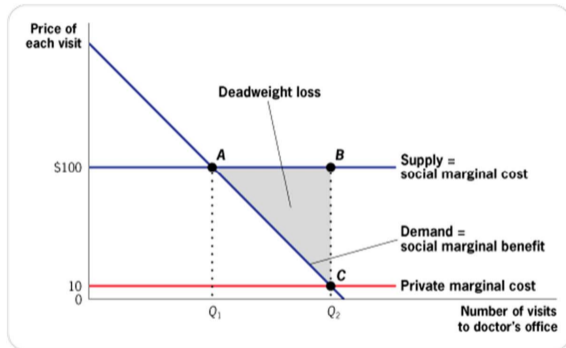
$$h'(q) = u(w) - u(b)$$

- Interpretation
 - Worker equates marginal cost of q with *private* marginal benefit (difference in utility between re-employment and unemployment). Unlike in the social optimum, he does not take account of the public benefit (fiscal cost of the benefit)
 - Note: if reemployed paid taxes we would have $q^*(b, \tau)$ [this is what we are buying in simplicity]

Tradeoff between insurance and incentives

- Because of insurance, private marginal benefit from re-employment is less than social marginal benefit
 - Therefore insurance distorts private behavior (here: search effort)
- Consequence: cannot achieve first best (equalizing marginal utility of consumption across states)
 - If consumption were same whether unemployed or not, would exert no search effort
- Holmstrom (1979): presence of moral hazard leads optimal insurance contracts to be incomplete, striking a balance between reducing risk and maintaining incentives

Welfare loss from moral hazard: graphical illustration



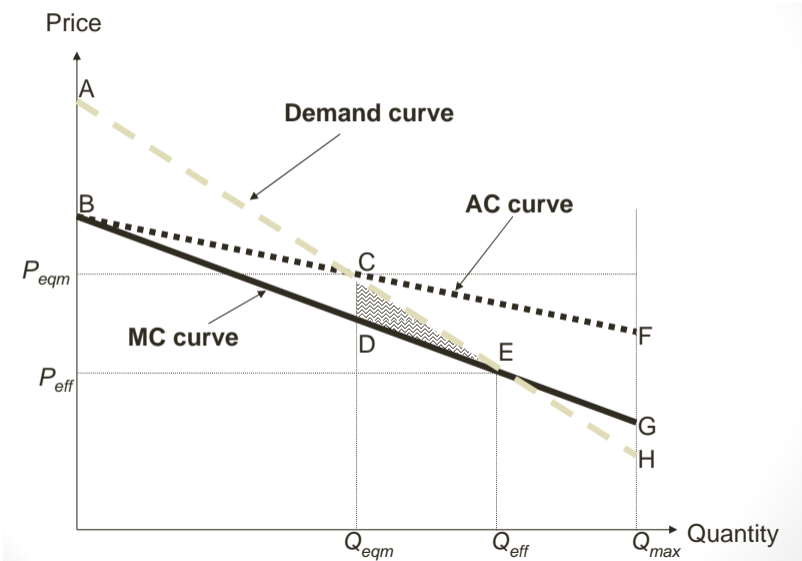
Patient-side Moral Hazard • With no insurance, at a cost of \$100 per visit, individuals would consume Q_1 doctor's office visits, where marginal costs and benefits are equal. With only a \$10 copayment, however, individuals consume Q_2 worth of visits, where private marginal costs equal social marginal benefit; this overconsumption of health care leads to a deadweight loss of ABC.

Source: Gruber textbook

Moral hazard reduces willingness to pay for insurance

- The extra insurance claims due to moral hazard raise actuarially fair premiums, but are not valued by individuals at their cost
- Imagine
 - An insurance policy with a 20% coinsurance (individual pays 20 cents per dollar of claims; insurance pays 80 cents)
 - Insurance increases expected claims by \$100 (from say \$500 without insurance to \$600).
 - Therefore expected insurance costs (hence premiums) increase by \$80
 - What is individual's WTP for (how much does individual value) that extra \$100 of healthcare use?

Moral hazard is therefore one reason not everyone "should" be insured



Potential design responses (markets or government)

- Provide only partial insurance
 - High deductibles (Arrow 1963)
 - Concavity of utility function suggests value of insurance is higher for larger losses
 - Optimal trade off between combatting moral hazard through higher consumer cost-sharing with the goal of providing risk protection through lower consumer cost sharing
 - Exclusions (e.g. life insurance policies don't cover suicide or sky diving accidents)
 - Partial experience rating (e.g. automobile insurance) - see discussion of reclassification risk
- Lump sum (indemnity) insurance
 - Observability? Residual Risk?

- Moral hazard (hidden action)
 - Introduces fundamental tension / tradeoff in design of optimal insurance (private or public)
- Adverse selection (hidden types)
 - Can impair efficient operation of market and create scope for welfare improving public policy

Food for thought

- Are moral hazard and adverse selection really distinct?
- "Ex post adverse selection" (Cabral Restud 2017)
 - Strategically delay healthcare treatment to minimize out of pocket costs (moral hazard)
 - Can generate subsequent adverse selection
 - Helps explain why market for dental insurance has largely unravelled
 - Implications for e.g. open enrollment period or annual caps (less effective as opportunity for intertemporal substitution rises)
- "Selection on moral hazard" (Einav et al. AER 2013)
 - Choice of high deductible vs no deductible health insurance plan can depend on anticipated behavioral response (moral hazard) to the deductible
 - analogy: all you can eat restaurants
 - Implications for e.g. policies to combat selection
 - eg better monitoring may not only reduce moral hazard but also selection
 - Related to broader idea of Selection on Gains / Roy Model

- Existence: how do we empirically detect selection
- Welfare cost of asymmetric information
- Welfare consequences of government intervention