Micro Economics (Intro)

I Price Discrimination (143 -)

- goal – use market power to capture CS ($$ left on table)
- how – charge each customer different price based on each customer's reservation price
- price discrimination – charging different prices to different customers
  - no P discrim - variable π = difference b/w MR and MC
  - 1st order P discrim – seller identifies reserve price of each customer
    - MR curve becomes the demand curve
    - variable π per unit = area b/w MC and demand curves (b/c pricing strategy <> effect cost structure
    - Rule – continue producing until MR = MC in each market (~ NOTE prices may differ due to differing ED)
    - Problem – impossible to know everything about everyone; Solution – 3rd order price discrimination
  - 2nd order P discrim – charge different P to different customers based on product / service use (~ quantity discounts)
  - 3rd order P discrim - segment population into groups of people w/ similar preferences
- conditions for P discrim – multiple E_D + market segmentation (allows charging diff P to diff customers) + seal market

- coupons / rebates (~ a form of P discrim b/w customers w/ different levels of P sensitivity allowing for separate P w/i 1 market)
  - types of P differential structures -
    - quantity differentials – cumulative discounts (over period of time) + quantity discounts (at 1 time) + functional discounts (according to position in distribution channels)
    - time differentials – segmentation through medium of time
    - clock-time differentials – recognize that E_D varies w/i each day
    - calendar-time differentials – E_D varies b/w days
    - product-use differentials – different E_D b/w types of customers (~ firm v. individual electric consumer ??)
    - inter-temporal price discrimination – E_D varies over time for same product (charge more when new)
  - valuing coupons – $(P_1 / P_2) = [(1+1/E_2) / (1+ 1/E_1)]$
    - e.g., if $(P_1 / P_2) = .8 / .6 = 1.33$ and P = $1.35 → coupon offered for ~ $.35 to equate P of two segments

- types of price discrimination -
  - individual customer – bargain every time + size up buyer's income + cut the price if you must ("secret" concession as last resort)

- group – promote new customers + forget the freight + get the most from each market (higher P in markets w/ lower competition) + favor the big buyer (~ Walmart) + skim the market (high margin product introduced to high income buyers w/ P gradually reduced to increase market penetration)
- product – make them pay for the label + appeal to quality (~ differences to quality are more than proportional to differences in cost) + lose the dogs + switch them off peak periods

- remember –
  - when price discriminate b/w markets → always price so that MR = MC in each market (~ **BUT** prices may differ due to differing E_D – i.e., P equate b/w markets only where E_D is same)
  - E_D determines markup above MC in each market [$E_D = (dQ / dP) (P / Q)$ and $MR = P(1 + 1/E_D)$ and $E_D > 1$ (elastic) means MR is positive and $E_D < 1$ (Inelastic) MR is negative and $E_D = 1$ means MR is zero]
  - $P_1(1+1/E_1) = P_2(1 + 1/E_2)$
  - ***Rule*** – mgmt maintains lower prices in market that has higher elasticity

- Process – How to P discriminate (generally)
  - i) identify reserve P (~ due to different E_D b/w customers)
  - ii) seal separate markets –
- Process – will P discrimination improve results (identifying the increased π)?
  - i) identify P, Q, and π for single market (horizontally sum (~ Q on left) to get single market Q_D and solve for P & π)
  - ii) find P, Q, and π if markets were separate (by taking the derivative of π function w /respect to each variable)
    - a) consider which market has more elasticity (of general interest only)
    - b) calculate π

II. Bundling (to increase PS)

- used when – when preferences vary across consumers
- works b/c – doesn't matter which product in a bundle a consumer has a high reserve P for

- Process – how to determine the optimal bundle (***Table form***)
  - **i)** identify each consumers reserve P for different goods and the bundle of such goods (for each customer, this is sum of individual goods)
  - **ii)** set up 2 tables (one for separate product Ps and one for reserve P for bundles) showing reservation P for each product and TR for each combination of reservation prices
  - **iii)** identify combination providing highest total revenue
- Problem – what if customer buys separate items; ***Solution*** – price bundle slightly less than separate items / price separate items high

III. Two Part Tariff

- Scheme – sell something by breaking P into multiple parts (access fee + usage fee ~ razor + blades)
- MC curve = maximum amount that can be sold w/o losing money
- CS – consumer surplus = ½ Q(b-MC) (where b represents the point at which MC curve crosses the Y axis)
- remember
  - selling at MC – maximize the amount of CS foregone
  - assume Q_D is linear and everyone has same Q_D
  - if charge less than MC (e.g., increase access fee) → MR < MC yields loss on marginal units
  - if encounter diff Q_D → always max π by setting user fee above MC in combination when considered w/ access fee
- Process – how to increase PS w/ two part tariff

  - **A)** all consumers have same E_D
    - i) draw CS subject to capture
    - ii) determine MC (take derivative of TR to get MR and assume MC = MR)
    - iii) ***charge access fee = CS ½Q(b-MC)*** (where b represents the point at which MC curve crosses the Y axis)
      - key – get most profit here w/ less in usage fee
    - iv) ***charge usage fee = MC***
      - flat MC curve – producer makes no money here b/c fee always = MC

- non-horizontal MC curve - creates 2 right triangles whose area c/b measured (note when MC crosses X axis) and the lower of which is covered by the usage fee = MC

➢ **B)** consumers have differing Q^D (~ health club w/ casual & serious members)
  - i) draw Q_D
  - ii) decide if want both types of individuals – if no → go after the higher π type; if yes → step (iii)
  - iii) experiment w/ combos of user / access fees to determine maximum π
    - a) charge both types the same fees
    - b) adjust level of fees to find max π

IV. Transfer Pricing

- in practice – all decisions delegated downward (never happens that one person sets all P)
- goal – coordinate production b/w divisions
- strategies – depend on
  - ➢ relative divisional position
    - horizontal – maximize π where MR = MC at both plants (b/c can always shift production to lower MC plant to make more π)
    - vertical –
      - company ($\pi = PQ - C_1 - C_2$) and (π max where π derivative $= MR_T - P^TQ - MC_2$)
      - DS Plant ($\pi_1 = PQ_1 - C_1 - P^TQ_2$) where π maximized such that ($MR = MC_1 + P^T$)
        - > focuses on C_1 b/c controls cost in Div 1 but not Div 2
      - US Plant ($\pi_2 = P^TQ_2 - C_2$) where ($P^T = MC_2$) and (π max where π derivative $- P^T = MC_2$)
  - ➢ who is the customer
    - in-house only – see vertical above
    - out-house also – (e.g., Div_1 = car; Div_2 = engine) – (see pg. 18.5)
      - $Q_1 <> Q_2$
      - $P^T = MC = P$ in outside market
      - $\pi_{firm} = TR(Q_1) - TC_2(Q_1) - TC_2(Q_2) + P^C(Q_2-Q_1)$
      - 2 decisions =
        - > **i)** how many $Product_1$ (Q_1) – where ($MR_1 = MC_1 + P^C$)
        - > **ii)** how may $Product_2$ (Q_2) – where ($P^C = MC_2$) because [$\pi^2 = P^C(Q_2-Q_1) + P^TQ_1 - TC_2(Q_2)$]
          - ¬ assume Div_1 always buys from Div_2 even if Div_2 has to get from market)
- remember –
  - ➢ each division is responsible for own costs
  - ➢ BOD chooses the transfer P's and ensures that these are pursued by setting P^T and defining π
  - ➢ never raise P^T to shift π b/w divisions as will cause ≥ 1 division to produce inefficiently
  - ➢ key = signaling w/i firm → want privately motivated mgmt to act in interest of whole firm
  - ➢ P^T must = MC to incentivize downstream mgmt (unless if competitive P → set $P^T = P^C$)
- Process – determining P^T
  - ➢ i) is there an external market for the upstream product? ***If Y*** → P^T = competitive P (P^C); ***If N*** → step (ii)
  - ➢ ii) (a) define firm π function + (b) define π function for each division + (c) derive MR for each division + (d) $MC=MR=P^T$

V. Oligopoly

- generally -
  - ➢ oligopoly = small number of sellers whose actions effect each other competing w/ similar products
  - ➢ a strategy = a choice of P and Q
  - ➢ equilibrium = how whole market ends up after each firms adopts its strategy

- Market Strategies – any of following are possible depending on actions of individual firms in market
  - ➢ **A)** Price Competition -
    - defn - each firm tries to grab market share w/o anticipating actions of rivals
    - pricing - each firm simply raises (lowers) output if P is greater (less) than MC
    - calculate - to calculate industry MC – sum each firms MC horizontally (to calculate firm MC – divide industry MC b/w firms)

- **B)** Collusion -
  - defn - firms recognize interdependence + collude to maximize total profit of all firms
  - how achieved - maximized TP is divided b/w firms such that MC of all firms is equal
  - calculate – **(i)** find Q_D + **(ii)** derive individual firm MC + **(iii)** horizontally add individual firm MCs to get industry MC + **(iv)** set industry MC = MR (i.e., this gives maximum jt π) + **(v)** divide π such that $MC_1 = MC_2$
  - note – firm w/ lower cost structure will produce more (i.e., which ensures that MC of firms are equal)

- **C)** Cournot -
  - defn - firms recognize interdependence + each firm presumes other firms will recognize this + all firms act simultaneously + firms take action based on what they think other firms will do to maximize π
  - calculate –
    - $P = a-b(Q) = a-b(Q_1 + Q_2)$ [where $C_1 = c+d(Q_1)$ and $C_2 = e+f(Q_2)$]
    - $\pi_1 = P(Q_1) - C_1 = [a-b(Q_1+Q_2)](Q_1) - [c+d(Q_1)] = (a-d)(Q_1) - b(Q_1)^2 - b(Q_1)(Q_2)-c$ (~ Reaction Function)
      - MR = MC such that $(a-d)-2b(Q_1)-b(Q_2) = 0$ or $Q_1 = [a-d-b(Q_2)] / 2b$
      - Reaction Function = shows $firm_1$'s best reaction to any choice of O/P by $firm_2$
    - $\pi_2 = P(Q_2) + -C_2 = [a-b(Q_1+Q_2)](Q_2) - [e+f(Q_2)] = (a-f)(Q_2) - b(Q_2)^2 - b(Q_1)(Q_2)-c$
      - MR = MC such that $(a-f)-2b(Q_2)-b(Q_1) = 0$ or $Q_2 = [a-f-b(Q_1)] / 2b$
      - shows how $firm_2$ will fix O/P relative to choice by $firm_1$
  - note – if the firms are accurate in their projections of other firms actions → equilibrium results
    - equilibrium occurs – when the choices made by $firm_1$ and $firm_2$ are compatible
  - Nash Equilibrium – occurs when each firm chooses π max level for own O/P given choice of other firms (i.e., given Q_2 → Q_1 maxes $firm_1$ π)

- **D)** Stackleburg (Price Leader) -
  - defn – firms make decision sequentially (~ wait to see what other firms do ~ firms tacitly agree who goes first)
  - how – $firm_1$ (leader) maximizes π by anticipating how $firm_2$ (follower) will react to $firm_1$'s action
  - calculate –
    - $\pi_{1(leader)} = PQ_1 - C_1 = [a-b(Q_1 + Q_2)]Q_1 - [c+d(Q_1)]$ which depends on Q_2
      - but $Q2 = [a-f-b(Q_1)] / 2b$
      - so $\pi_1 = [a-b(Q_1 + \{a-f-b(Q_1) / 2b\})]Q_1 - [c+d(Q_1)]$
      - and $firm_1$'s maximized π is expressed entirely in terms of Q_1
  - result – leader π rises while follower π falls (i.e., it is more profitable to lead than to follow – this is shown by solving for π twice (once w/ $firm_1$ leading + once w/ $firm_2$ leading))
  - note – there may be a race to see who goes first

- remember
  - no one solution / equilibrium exists
  - cartel – may be broken if one member breaks P setting understanding and lowers P to earn more $
  - more direct competition = lower π for all (more collusion = more π for all)
  - total π can be shared differently at any given level of collusion / competition

VI. Price Leader w/ Multiple Followers (31 – 32)

- defn – all firms accept that one firm sets P for all to follow
- e.g., setting of interest rates
- effect – all other firms are P takers (~ perfect competition) and produce Q such that P = MC (i.e., MC curve becomes the supply curve)
- Process – for P leader to maximize π
  - i) determine market supply curve for followers (Q such that P = MC)
  - ii) determine how much Q_D is left after followers sell their fill (i.e., "residual Q_D")
    - residual Q_D = original Q_D – that taken by P takers = original Q_D – MC (sum horizontally)
  - iii) set $MC_{P\ leader} = MR_{P\ leader}$ to maximize π_{leader}
  - iv) Determine Q supplied by followers (given (i) above)
  - v) check – market Q_D should equal market supply

VII. Game Theory (35 – 40)

- goal – systematic way of deriving strategies
- applies when – decision is made in situation w/ other players + high degree of interdependence such that each player choice affects other players + players maximize results by knowing / guessing what other players will do
- Types of Games / Strategies -

  - **A)** Dominant Strategy – both players have an optimal choice which is irrespective of what other player does

  - **B)** Unilateral Dominant Strategy –
    - one player ($Player_1$) has an optimal choice which is irrespective of what other player ($Player_2$) does
    - $Player_2$'s best strategy depends on what $Player_1$ does
    - note – with enough info and assuming $Player_1$ is rational, $Player_2$ should know what $Player_1$ will do to maximize π (i.e., and $Player_2$ can know what is its best strategy)

  - **C)** Iterative Dominance (another Dominant Strategy) –
    - no dominant strategy for either player
    - BUT – equilibrium may still exist
    - finding an equilibrium -
      - i) identify "dominated strategies" (i.e., a strategy which a player will never choose b/c some other choice always provides a better result)
      - ii) each player makes choices assuming that all players are rational and will not choose a dominated strategy
      - iii) equilibrium = when only one combination of choices is possible given (i) and (ii) above

  - **D)** Prisoner's Delimma –
    - players could maximize π if both held P high
    - H/E – one firm can increase its π by lowering P while other firm holds P high
    - Nash Equilibrium (NE) – occurs when each player optimizes strategy given the strategy of other players
      - how to find NE–
        - i) "mark" boxes for $Player_1$ that provides the best result given a choice made by $Player_2$
        - ii) "mark" boxes for $Player_2$ that provides the best result given a choice made by $Player_1$
        - iii) Nash Equilibrium occurs in boxes w/ most "marks"

  - **E)** MaxiMin – strategy that maximizes the minimum possible outcome for you
    - use when – $Player_1$ is not sure that $Player_2$ will act rationally

  - **F)** Multiple Equilibria –
    - key point – Nash Equilibrium fails when multiple equilibria occur

  - **G)** Repeated Games (Tit for Tat) -
    - use when - game involves multiple rounds
    - goal – trying to get other players to choose a P that maximizes π for all
    - how –
      - **i)** round 1 – Player1 chooses P that will maximize π for all players
      - **ii)** round 2 - if $Player_2$ did not choose a round 1 P that maximized π for all, $Player_1$ chooses a P that reduces $Player_2$'s π in round 2 (which may also reduce $Player_1$'s round 2 π)
        - $Player_1$ is attempting to induce $Player_2$ to cooperate
      - **iii)** round 3 – $Player_1$ again chooses P that will maximize π for all players and sees if $Player_2$ responds in kind
      - **iv)** round 4 (and beyond) – repeat round 2 strategy as needed
    - fails when – 1st mover advantage exists (??)

  - **H)** Sequential Games (39)
    - use when – Players take turns
    - consider – is there a first mover advantage
    - strategy - ??????????????????????

  - **I)** Threats and Credibility

- use when – one Player has ability to influence other Players' actions through the use of credible threats
- e.g., - monopolist fears entry of new competitor + monopolist communicates willingness/ ability to drive any competitor from the market with P competition
- remember – threat lacks credibility if threatening Player would make less money by implementing the threat than if threatening Player did not implement threat (even considering effect of new competition)
- how – make game more expensive to play (e.g., build plants that provide economies – T/F any competitor will be forced to build or use more expensive cost structure)
- note – making the game more expensive may reduce monopolist's π now but result in the benefit of preserving higher avg π over LT (i.e., threat may have t/b costly to monopolist t/b credible)

➢ **J)** Centipede Game
- repeated game
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- Process
  - ➢ i) identify choices available to players
  - ➢ ii) know the rules of the game (~ sequential, simultaneous, repeated, etc)
  - ➢ iii) determine what info is available to players re their rivals
  - ➢ iv) consider how rational the players are
  - ➢ v) create matrix (rows = choices of Player 1; columns = choices of Player 2; cells = results from choices (row, column))

- Remember –
  - ➢ concept of equilibrium is critical – equilibrium = likely outcome of the game (i.e., where the game can come to rest)
  - ➢ backward induction –
  - ➢ reputation – history of past behavior → heuristic in face of uncertainty (consider incentive to invest in reputation)

VIII. Auctions

- 3 P strategies
  - ➢ Posted P – consumers purchase all they want at given P
  - ➢ Bargained P – each P is unique to the transaction
  - ➢ Auctions -
    - goal = increase monopoly rents by increasing PS (and reducing CS)
    - used for – unusual / unique items
    - how – forces consumers to reveal info (e.g., their reserve Ps)
    - best strategy = forcing bidders to reveal info before seller chooses P (e.g., require bids be submitted before choosing a P that maximizes its π)
- types of auctions -
  - ➢ **A)** Sealed Bid – consumers make sealed bids
    - goal – limit collaboration + force bidders to bid closer to their reservation P
    - who wins - highest bid wins
    - strategy – next highest reserve P + epsilon
    - bidding strategy to maximize π
      - ➢ **X)** independent bidding strategy (i.e., each bidder know nothing about other bidders)
        - i) determine estimated π associated w/ each possible bid amount (calc as: π if you win - actual bid amount)
        - ii) determine the actual expected π by applying the probability that any sealed bid amount will win
          - ♦ if multiple bidders participate – probabilities are raised to the X power where X = number of bidders participating (i.e., there is less chance at any level that your bid will succeed)
      - ➢ **Y)** interdependent bidding strategies
        - **a)** if all bidders have same reserve P → best bid is at that reserve P
        - **b)** if bidders have differing reserve P's
          - ♦ **y)** one other bidder→ the bid that maximizes expected π = expected value of the reserve Ps of other buyers that are at / below your reserve P (**remember** – rescale probabilities)

- ♦ **y)** more than one other bidder → same as (a) but achieved by **(i)** considering the probabilities of all combinations of other bids (i.e., probability raised to the X power) and **(ii)** remembering that you only have to beat the highest competing bid

➢ **B)** Dutch Auction – starting bid is given by seller and progressively dropped until some consumer makes offer
  - goal – first offer will be highest reserve Price of all bidders
  - who wins - first offer wins
  - note – more bidders → gets seller closer to highest reserve P
  - strategy – bid reserve P

➢ **C)** English Auction – customers start and continue bidding higher prices (~ contra Dutch Auction)
  - winning bid is slightly higher that the second highest reserve P
  - who wins - winner is last high bid that is not topped
  - bidding strategy – in each round, submit the lowest bid possible (that is above the last highest bid) until you reach your reserve P (π = your reserve P – nearest lower bidder's reserve P)

- Winner's curse -
  - ➢ arises when – value of object being bid for is uncertain (e.g., oil exploration rights)
  - ➢ problem – risk is that winning bid will occur at above the actual value of the object
  - ➢ generally – more bidders and / or more uncertainty = greater risk of over bidding

- limits -
  - ➢ organization costs (mitigated by internet)

- remember -
  - ➢ more bidders = less likely to get a bargain (so seller wants more bidders to participate)

IX. Decision Making with Risk (Expected Utility) - (47-52)

- adverse selection – occurs when all probabilities are not known

- moral hazard – occurs when potential losses are not known

- goal – explain how people make decisions based on their individual preference schemes (~ internal classification systems)

- Expected Value (EV) ***= Sum $p_i W_i$*** (where W = possible wealth levels and p = probability of obtaining that wealth)
  - ➢ calculated by - (i) multiplying each possible outcome by its probability + (ii) summing all the products
  - ➢ aka – the mean; measure of location; central tendency
  - ➢ problem – EV ignores risk (~ assumes risk neutrality)
  - ➢ St. Petersburg Paradox –
    - situation – flip coin + pay $\$2^n$ (where n = the first flip that comes up heads)
    - result – EV is infinite

- Expected Utility (EU) = ***Sum $p_i U(W_i)$*** (where W = possible wealth levels and p = probability of obtaining that wealth)
  - ➢ benefit – EU captures risk
  - ➢ evaluating a person's Utility Values
    - expected utility hypothesis – when faced w/ uncertain outcomes → people consider the expected value of their utility of wealth (NOT the expected value of their wealth)
  - ➢ based on absolute values (not relative – if would walk block to save $10 → should do regardless of P = 10 or 100)

  - ➢ risk = variance across payoffs
    - limits the EU of a given EV

  - ➢ risk aversion
    - is implied by a concave utility function (~ people receive less utility from higher EV because of greater risk)
    - given choice b/w two options w/ same EV → risk averse person will choose option w/ lower risk (even if it means sacrificing some income
  - ➢ risk premium = EV w/o insurance – EU w/o insurance
    - is required to induce people to take an action involving risk
    - amount willing to pay to get rid of risk

- remember – always take expected value of the utilities (NEVER take the utility of the expected value)

- insurance – as an example of risk aversion
  - note - people pay big markup to minimize risk (~ when buy insurance → expected wealth falls)
  - calculating premium – **EV of EU**
    - **i)** utility function must be given
    - **ii)** calculate difference in EU (given the applicable probabilities) w and w/o insurance
  - law of large numbers –
    - allows individuals to lower risk by pooling together
    - requires no / low correlation b/w individuals + individuals independent
  - certain monetary equivalent – the certain $ amount giving the same utility as a risky situation
  - loading of policy – combined costs of labor, capital, materials to provide an insurance product
  - co-payments – insurance pays a fraction of the loss (~ rate of co-payment)
    - coverage = loss – Co-pay = Loss - c*loss = (1-c)*loss
  - deductible – insured pays the first D dollars of a loss
    - coverage = loss - D
  - remember
    - deductibles and copays have value when problems of adverse selection and moral hazard exist
    - D & Cp = separates customers in face of adv selection + control overuse in face of moral hazard

- Stock buybacks -
  - key = total profit realized (difference b/w FMV and repurchase P)
  - auction – allows S/H to reveal their reserve P

X. Information

- second best strategy = optimal strategy given imperfect info

- adverse selection – asymmetric information causes one party to know her true "type" while another party does not

- moral hazard – occurs when asymmetric info exists resulting in hidden actions

- Value of Information –
  - information has value only if it changes your decision
  - process
    - **i)** find difference b/w EV w/ and w/o forecast
    - **ii)** account for probability that forecast is wrong

- Principal Agent problems -
  - Principal perspective - EV = E(π)
  - Agent perspective - consider EV of EU of salary
    - flat salary – low alignment w/ Principal
    - profit related comp – higher alignment w/ Principal
  - solutions
    - a) straight wage –
    - b) bonus plan -
    - c) profit sharing -
  - implications
    - decentralized divisions may hide potential to "lower" the bar
    - practical solution = market in mgmt (T/O, proxy fights, etc.)

- disincentive to S/H monitoring = free rider problem

- Asymmetric Info -
  - self selection - offering choices to consumers → allows consumers to reveal info
  - signaling – optimal strategies = based on belief strategy sets (~ given beliefs → optimal strategy is . .)
    - insurance – giving buyers a choice allows them to reveal what type of risk they are
    - warranties – allow producers to signal quality of product
    - education – ~ signals productivity
      - separating equilibrium – when agents of one type take an action while other type agents act different
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XI. Moral Hazard

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XII. Adverse Selection

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XIII. Tragedy of the Commons

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