**Official List of Formulas for Econ 100M -- UCSC, Winter 2013**

I. Supply & Demand

Elasticity of y wrt x= (x/y)(∂y/∂x) or in log form (∂lny/∂lnx), normal range for D: (-∞, 0] S: [0,∞)

Demand Elasticity: **ξ**<-1 elastic, **ξ**=-1 unitary, 0> **ξ**>-1 inelastic; Supply Elasticity: 0< **ξ**<1 inelastic, **ξ**=1 unitary, **ξ**>1 elastic

Comparative Statics: dp/da = (-∂S/∂a)/(∂S/∂p+│∂D/∂p│) for supply shift, similarly for demand shift, then ∆p\* = (dp/da)∆a & ∆Q\*=(∂D/∂p)∆p\*

Determinants of D: Price of related goods, income, # of consumers, future expectations, tastes/preferences, …

Determinants of S: resource/price availability, government actions (taxes/regulations, subsidies), technology/productivity, # of firms, future expectations, …

Tax incidence: On consumers = ξS /( ξS - ξD) on suppliers = ξD /( ξS - ξD) \*multiply by tax size, t.

II. Consumer Choice & Demand

MRS = Slope of IC = -MU1/MU2 ;Marginal Utility = MUi= ∂U/∂qi Budget line slope = -p1 / p2

Constrained Optimization: maxq1 , q2 L = U(q1 ,q2) + λ( Y-p1q1-p2q2) take FOC’s and solve for q1 ,q2

Income Elasticity of demand: **ξ** = (∂Q/ ∂Y)(Y/ Q)

Consumer Surplus = CS = area below demand curve above price line.

For quasilinear utility, CS = u(q1\*) - p1q1\*; First-orderapprox: -∆CS = ∆p[q1] + [(∆p∆q) / 2]

III. Production, Cost & Supply

Returns to Scale for CES prod fn: q = (Kp + Lp)a/p IRS if a>1 CRS if a=1 DRS if a<1

MRTS = Slope of Isoquant = -MPL / MPK ; Slope of Isocost line = -w / r

Elasticity of Substitution: [%∆ K / L] / [%∆│MRTS│] = [∂ln(K/L)] / [∂ln(│MRTS│)]

Total C = FC + VC(q); MC = ∂C/∂q; AVC = [VC(q)] / q]; AC = C / q ; SRMC = w / MPL

Tangency: MPL / MPK = w/r = -MRTS, i.e. slope of isocost = slope of isoquant @min-cost inputs

λ= r /MPK = w / MPL = MC “equal bang for the $”

FC = sunk cost + avoidable cost; in long-run, FC=0

Supply in SR = MC where it is upward-sloping above AVC ; with economic profit above AC

Supply in LR is perfectly elastic at min AC (unless industry-wide effects cause IRS or DRS).

Profit max at MC(q\*) = p (= MR(q\*) for competitive firms); Profit: π = R – C = R(q) – VC(q) – FC;

Avg Profit: π/q = P-AC

Expenditure avg Income Elasticity: **θ1** ξ1 + **θ2** ξ2 = 1

Keys to Compet. Mkts: 1) Low barriers to entry 2) Homogenous products 3) Low transaction costs

Residual Demand: Dr(p) = D(p) – So(p) where Dr(p) : residual quantity demanded ,D(p): Total quantity demanded by market, So(p): Supply of other firms

Market elasticity: εi = nε – (n – 1)η0 where n: number of identical firms, η0: elasticity of supply of each of the other firms

Profit: π = R – C → π(q) = R(q) – C(q) → π(q) = R(q) – VC(q) – FC

Avg Profit: π/q = P-AC

Total Output (in Long Run): Q = nq where n: number of firms, q: quantity firms supply

I. Welfare

Producer Surplus: Area above S-curve (MC) & below p\*-line ʃq\*[p-MC(q)]dq = pq\*-VC(q\*)

Social Value: CS+PS=SV (max at competitive eq.) = ʃQ[D-1(Q)-S-1(Q)]dq = ʃQ[MB(q)-MC(q)] dq

DWL: loss of SV (due to, e.g., Quota, Price floor/ Ceiling, Tariff, ...)

II. General Equilibrium

Edgeworth Box: IC’s are tangent where there are no further gains from trade, i.e., at Pareto Optimum: can’t make anyone better off with hurting someone else, i.e., where MRSA(C\*) = MRSB(C\*) = Px/Py . The Contract Curve is the set of such points preferred by everyone to endowment.

Autarky (no trade) optimum at MRS=MRT=price ratio. (FOC)

Steps for finding optimum production, consumption, and trade: 1)Find comparative adv by comparing autarky price ratios. 2) Given price ratio for trade, pick Q=(qa,qb) to max I=a+pb (I is the a-intercept); FOC is MTRS(Q)= Pa/Pb. 3)pick C on that budget line to max utility; FOC is MRS=Pa/Pb

III. Market Power

Operates either at MC(q)=MR(q) (with p\* determined by D-Curve) or at q=0 (shutdown).

To find MR, take D-1(q), multiply by q & take derivative (MR<p).Often produces DWL

Sources of Market Power: Natural: Sole owner of key input (e.g., rare earth), industrial-level economies of scale, network externalities. Artificial: Gov’t patent/licensing.

Policies to deal w/ DWL: remove barriers to entry, drop quotas &license hassles, set price ceilings

IIII. Factor Markets

Case 1) Perf. Competition in SR: w=MRPL(q) where MRPL=p\*MPL or MR\*MPL (Solve for SR Demand for L(w) by finding MRPL, setting equal to w, and solving for L); in LR also: r=p\*MPK(q) where MRPK=p\*MPK or MR\*MPK

Case 2) Monopoly: MR=p(1+1/ԑ), substitute MR for p in all MRP expressions and proceed as before

Case 3) Monopsony: max’s profit where ME=D-curve (p\* determined by S-Curve), where MEL=w(L)+L(dw/dL)> w. FOC is MEL = MRPL.

IV. Real Investment Theory (Fisher)

“Thrift”: -Slope of IC=-MRS=1+MRTP (# of extra units of C1 to compensate for reducing C0 by a unit)

“Productivity”: -Slope of PPF=-MRT=1+MROI where marginal return on investment =f’(x)-1

-Slope of budget line= P0/P1= 1+r, where r=real interest rate; C0 1+rC1  (called borrowing when ∆C0>0, Lending when <0); w=PV of C(c0,c1)=C0+C1/(1+r); C0-intercept of budget line through C.

Pick Q to max w(x)=PV(Q); FOC is r=MROI; PV increases (decreases) when MROI>r (<). This Q is independent of U (Fisher Separation Thm). Then pick C to max U given the budget line for that PV; FOC is r=MRTP. Q-C determines borrowing b (=lending if b<0). Equilibrium r\* determined at pt. which total market Borrowing= Lending; thus r\* is increased by increased productive opportunities (MROI) & increased impatience ( MRTP).

V. Externalities

Defs: Cost or benefits to people not included in in a market transactions; A wedge between private &social cost or benefit MSC>(<)MPC or MSB<(>)MPB.

Efficiency at MSC=MSB, self-interest eq. at MPC=MPB, so externalities create DWL at self-interest eq

Remedies: (internalize the externality) by 1. Social Norms, or 2. Fines or Taxes or subsidies, or 3. Privatization, or 4. Quotas & regulations. Coase Thm (connected to privatize property):Assume –quasi-linear prefs.-negligible transaction (or bargaining) costs; Then any clear assignment of property rights yields an efficient outcome (MSC=MPC). Public goods are extreme examples; non-rival consumption implies MSB = n\*MPB, and non-excludability implies that private provision will be insufficient.