

Ag. 468

General Theory

5-17-62

1. Time-average: [I goofed, by reversing denominator, last week] ??

$$a = \frac{i R_T}{(1+i)^T - 1}$$

Derive: $R_T = a_0 + a_1(1+i) + \dots + a_T(1+i)^{T-1} = \sum_{t=0}^{T-1} a_t(1+i)^t$
 $\sum = \frac{1-r^{n+1}}{1-r} = \frac{1-(1+i)^T}{-i} = \frac{(1+i)^T - 1}{i} = \frac{R_T}{a}$; so $a = \frac{i R_T}{(1+i)^T - 1}$

If $i = 0$, get $a = \frac{R_T}{T}$, by L'Hopital's theorem.

$$\left[\frac{\frac{di}{di}}{\frac{d(1+i)^T}{di}} = \frac{1}{T} \right]$$

If $T = 0$, get ∞ .

Use Tables

T	$a \div R_T$ @ 6%
5	15.6
10	1 ÷ 13.2
20	1 ÷ 36.8
40	1 ÷ 155
80	1 ÷ ca. 5,000

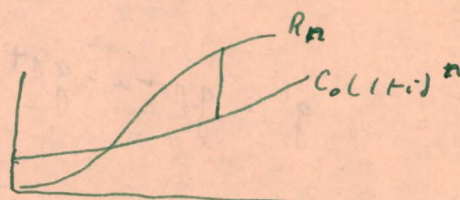
T	a
0	∞
1	R_T
2	$< \frac{1}{2} R_T = \frac{R_2}{2+i}$
3	$< \frac{1}{3} R_T = \frac{R_3}{3+3i+i^2}$
4	$\frac{R_4}{4+6i+4i^2+i^3}$

2. Use to plan optimal life for lumpy inputs, max. a .

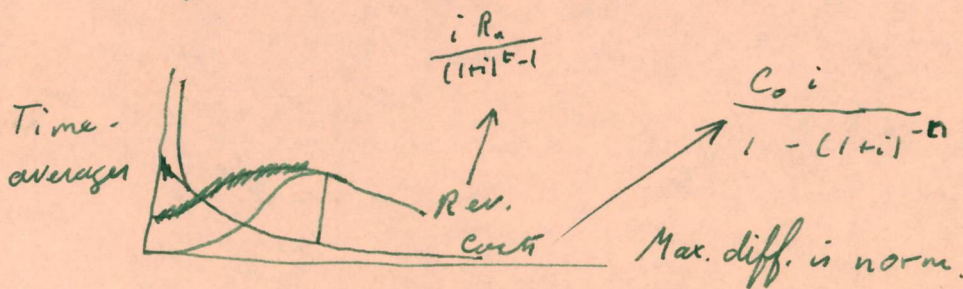
~~Finke~~, is Carry all R_n forward to t , then annualize, then max. is universal formula.

a. e.g. Finke

$$a = \frac{i [-C_0(1+i)^T + R_T]}{(1+i)^T - 1}$$



Not max. $[R_n - C_0(1+i)^n]$. Max. a falls left of that
 Max. excess of time-ave. R over time-ave. C_0



Derive annualization formula. t is no. of yrs. over which are annualizing R - the no. of annual payments.

$$R_t = a_t + a_{t-1}(1+i) + a_{t-2}(1+i)^2 + \dots + a_1(1+i)^{t-1} = a \frac{1 - (1+i)^t}{-i} = a \frac{(1+i)^t - 1}{i}$$

$$= \sum_{k=0}^{t-1} a_{t-k}(1+i)^k$$

[If a_t is included, then last term is a_1 ... then get t terms, t years.

If a_t is excluded, a_0

If exclude a_t , $R_t = a_{t-1}(1+i) + \dots + a_0(1+i)^t = a \frac{r - r^{n+1}}{1-r} =$

$$a \frac{1+i - (1+i)^{t+1}}{-i} = a \frac{(1+i)^{t+1} - 1}{i} + a$$

a is at end of year one, same as beginning of year 2. So miss one year's interest on it - hence compound by $(1+i)^{t-1}$.

3 ways to max a :

1. $\frac{da}{dt} = 0$

2. Simult. equality, slopes & ordinates, g and $T (= C_0(1+i)^t + a \frac{(1+i)^t - 1}{i})$

3. Marginal, $g' = g\rho + a$

$$g' = g\rho + a = g\rho + \frac{r[g - C_0(1+i)^t]}{(1+i)^t - 1}$$

$$\rho = \frac{g'}{g + \frac{g - C_0(1+i)^t}{(1+i)^t - 1}} = \frac{g'[(1+i)^t - 1]}{g - C_0(1+i)^t} = \frac{g'}{g - C} \phi$$

~~1/2~~ a - 1.

Some products yield little rent, e.g. Timber. Uses little land/tree, & usually poor land.



To max a means getting a up to 0, or a little above.

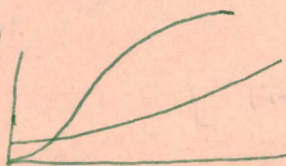
In terms of time-aver:



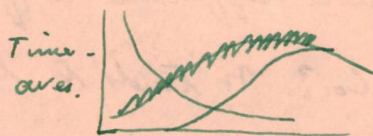
Wd. reach virtually same results by maxing i_B , or present value.

Others use more land, better land - they must turn over fast. Cattle (on pasture)

over



Land a big factor.



b. Most products, that yield regularly, & depreciate

$$a = \frac{i \sum R_n (1+i)^{t-n}}{(1+i)^t - 1}$$

Cost curve not so diff. from timber, but heavy costs come first

Rev. curve quite diff., but heavy revenues come near first.



Hence higher b.v. - & much more urgency. Cpl. vs. Timber, revs are at more frequent: & b, at beginning of cycle.

Maturity comes when $\frac{g'}{g - C_0} = \rho \frac{(1+i)^t}{(1+i)^t - 1}$

$$\text{or, } \rho = \frac{g'}{g - C_0} [1 - (1+i)^{-t}]$$

The smaller is $\underline{t}$, the more difference in fund. mat. due to land.

(How explain presence of C_0 ? It tends to lengthen return.

Is it in if use Fisher formula? ~~No~~ No. No correction coeff., Φ , is not actually the true correction, but overstates it, but Fisher says just $\rho = \frac{g'}{g}$. C_0 is properly part of correction, but I omitted it to

simplify - & exaggerate.

But when $t = \text{just } 3$, $\Phi \approx \text{.20}$, maturity comes when growth very rapid, = 5% or 5p.

c. Note analogy of time & space.

Spreading lumpy inputs over one or the other.
Rent serves as constraint on land-time as well as space.

d. Use in clipping off present uses - ave. from future use in mgnl cost of land-time in present use (has future one. = mgnl. Same as in space. they may be unequal.)
[Unless you must clip off future use, too - then mgnl land-time value exceeds a, until ~~the~~ challenger $\neq 1$ is squeezed out completely & you get Ely's case.]

~~From~~

3. Spreading cap. inputs over space. intensity & scale.

Class define MNP.

Intensity. Homog. land shd qurly be comparable. Only if MNP curve is flat-topped, no critical intensity, can they differ much, ealy. (But note, intensities must be judged over time. Intens. & cap x turnover)

Might apply same cost by series of cheap bids as one expensive one)
Scale - has to do w. factor proportion. Depends on factor relative prices cheap land, dear labor. Usually exploitive

appreciating land, too. ~~the~~ Scale - sq innovations make land ~~dear~~, appreciate, ~~scale~~ thus & scale by that route, also.

5-24

Land as constraint on scale.

Cap. inputs are the lumpy ones

also mgnl. talent

also fact. strength

Those give deciz costs.

Land gives sq social costs - both in space, & time

So dear land means smaller, less durable inputs.

Taxation the means. $MC = V(i + r - \frac{\Delta V}{V})$.

r must be hi to: a) Swamp $\hat{=}$ differentials

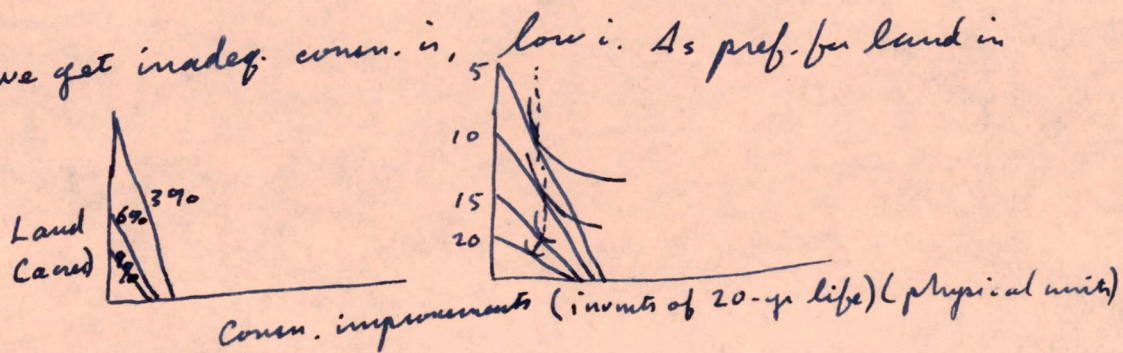
b) Swamp $\frac{\Delta V}{V}$

Thus make all landholders feel social costs as priv. ones.

One reason we have problems of excessive size is bus land fails to serve fm. of constraint. Reasons:

1. $L_0 i$ vs. $L_1 i$
2. H_1 outis $\frac{\Delta V}{V}$
3. Subsidize peripheral xptn.

One reason we get inadeq. consn. is, low i . As pref. for land in portfolio mix.



As lower i v., opp. lines move in favor of land. (cf. file on $L_0 i$ 2 promoting consn.) (20-yr invm't also turn over faster, thus add to vol. of bus. more, affect equal-output isoquants)

So lowering i of indvid. just comes to buy more land. Also consn., but less so per acre. [Except timber, even more i -elastic than land]

Lower all i v., helps consn. probly. But as relative diffs in structure of i v.; raises $L_0 i$, hurts cap. further.

Low i.g. means low vol., hi margin?

3 $\frac{1}{2}$

How about cap. turnover as related to i.g.? Land-intensiveness means to turnover.

Risk & intensity. (& leverage)

Are intensive uses really riskier? How about risk of losing rent invmt., where that is hi %?

I overlooked that in earlier i.g. thinking. Was identifying landholder & current "carrier" - a fallacy I have since retracted. 100% imputation means ~~inf~~^{very hi} leverage per carrier, regardless of i.g.

Terminology (Call the carrier the "investor"; thus borrow macro-e. terminology)

Investor can have several kinds of cushion. Hi profit margin is one. But that is not likely to be hi - not true profit. Next best is owning ^{hired} inputs, so their fixed imputed returns (payments) can be deferred. - or returned, let us say, preferable usage. Thus they can form cap. immediately ... funding of a flow -- & absorb losses. That assumes they have no fixed external claims on them, e.g. supporting non-earners, & provide flexibility. It is that, & not their factor nature as land or labor that is of essence here.

W. 100% imputation, it is ~~clearly~~^{probably} low i.g. crops that are riskier, bes of the higher natural input, & nature is capricious. Their lower risk is thus an imputational fallacy, based on identifying landowner & investor.

To offset this risk, so i.g. landowners adjust by using crops like barley & wheat ^{& etc} that are more stable & storable than

tomatoes, fruit,

Is still something to ideal land owner terms own, so you can only lose inc., not price. But to current investor, who funds land service, can lose fund.

4. Rent as constraint on occupying space others must traverse.

Location valuable. Central holders impose xpt costs on outlanders. Last outlander wd. bid for any center lot the xpt. saving, so no one spreads out unless he needs land as much as cost he imposes on himself.

5. Xpt. rates But we subsidize xpt., so social costs too low. Subsidizing xpt. is ok, if done right.

MC pricing, so far as Hotell's went, is ~~not~~ ok, but assumes away space (& time).

Actually, product not homogen. when it is xptn. Must recognize each delivery point as separate operation. Hotell's anal. applies to movg betw. 2 points. (Or, by extension, w-in fixed perimeter.)

Recall blue book postulated Δg costs in wth, by assuming must go farther for wth. But those Δg costs came from pressing on limits of wth from one source - not from xptn itself, save as longer lines sub. for wth

Need criteria for rate policy. Now we use postage-stamp principle, spread rent thin

Ricardian Capitalism

$$\text{Equate: } \frac{i \sum (L.S.K_n) (1+i)^{t-n}}{(1+i)^t - 1} = \text{l.v.m.c.}$$

p. 38

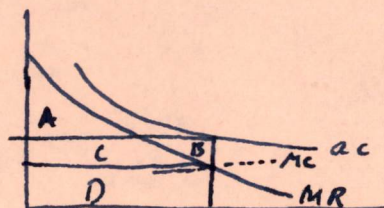
Reasoning here is that we want that pattern of s.r.m. that is equivalent of pay'g l.v.m.s. as steady annual sum.

S.r. price policy shd. follow s.r.m.c. - usually doesn't.

Bilateral mpy., or several of them. No compn either way.

allocate sleeve length to each outlet.

How far extend service?



Note, we do not push out until we stop creating rents!

Thus, there is no 'marginal' land, no gradual transition, but a clean break!
Of course, the land is marginal after taxes! But it will have hi yields.

Land tax relatively more important at margins, both spatial & temporal.

assignments next time.

1. Incl Maturity, theoretical section only.

2. Put works cited there on reserve.

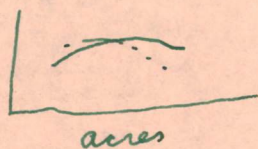
1. pp. vi - 25; 45-58; 60-76.

HAMMERMILL
BOND
MADE IN USA

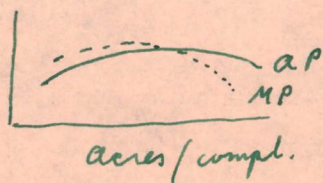
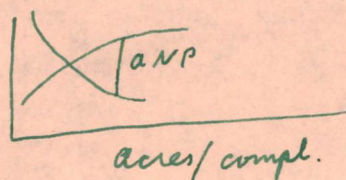
Thurs, Feb. 8, 1962

1. MRP of land

a. Fixed scale, change intensity

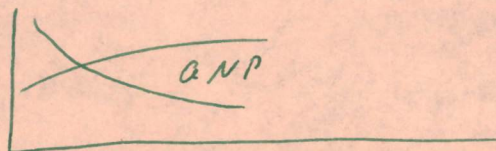


But scale Δs



b. Δg scale.

a variety of intensity.



[c. Risk. Intensity quotient. Next time]

2. MC of land

$$MR = P_i - \Delta P + P_e$$

3. Tax capitalizn.

Pass out sheets

$$P = \frac{MR + \Delta P}{i + r}$$

4. Land development (vs. improvement)

MC pricing. Rationale

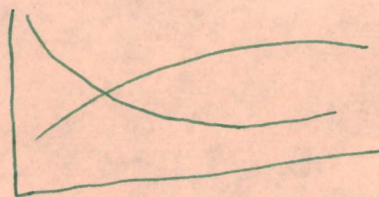
a. Elementary

b. Telescope principle

5. Duration of improvements.

The time-average: $a = \frac{i R_T}{(1+i)^T - 1}$

$$a = \frac{i \sum R_n (1+i)^{T-n}}{(1+i)^T - 1}$$



Hit the max.

Mqul. & ave. products of time.

6. Justification of interest

$p + p_i$

Present values of assets of different usable lives, n , yielding incomes that decline by a fixed annual percentage, d , beginning from \$1 a year. Table shows effects of using different interest rates.

$$v = \frac{1+i}{1+d} \left[1 - \left(\frac{1-d}{1+i} \right)^n \right] = 1 + \frac{1-d}{1+i} + \left(\frac{1-d}{1+i} \right)^2 + \dots + \left(\frac{1-d}{1+i} \right)^{n-1}$$

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$i \rightarrow$		.00	.01	.03	.05	.10	.20	.50	(1) ÷ (7)
d	n								
↓	↓								
1.0	2	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
.9	2	1.10	1.10	1.10	1.10	1.09	1.08	1.07	1.03
.5	4	1.88	1.86	1.83	1.81	1.75	1.66	1.48	1.27
.3	7								
.2	10								
.1	20	3.80	8.28	7.40	6.69	5.40	3.98	2.50	3.52
.07	28	12.2	11.4	9.71	8.45	6.41	4.44	2.63	4.63
.05	40	17.4	15.4	12.4	10.3	7.31	4.80	2.73	6.37
.03	67	28.7	23.6	16.9	13.1	8.45	5.22	2.83	10.14
.02	100	43.5	32.4	20.5	15.0	9.17	5.45	2.88	15.10
.01	200	87.0	49.5	25.7	17.5	10.0	5.71	2.94	29.59
.00	∞	∞	101	34.3	21.0	11.0	6.00	3.00	∞
-.01	∞	∞	∞	51.5	26	12	6.3	3.1	∞

2d row ÷ next
to last row

0 .01 .03 .05 .10 .18 .36

Table 1 A: Table of land values as determined by combined interest rates and tax rates, with annual net rent equal to \$1.

$$V = \frac{1}{i + t}$$

$i \rightarrow$	.02	.04	.08
$t \downarrow$	<u>Land Values in \$</u>		
.00	50	25	12
.01	33	20	11
.02	25	17	10
.03	20	14	9.09
.04	17	12	8.33
.05	14	11	7.69
.10	8.33	7.14	5.56
.15	5.88	5.26	4.35
.20	4.55	4.17	3.57
1.00	.98	.96	.93

Table 1 B: Bids for land as determined by combined interest rates, tax rates, and marginal imputable rents. The high bid is circled at each tax rate.

$$\text{Bid} = \frac{\text{Rent}}{i + t}$$

$i \rightarrow$	.02	.04	.08
Rent $\rightarrow$	\$3	\$4	\$5
$t \downarrow$	<u>Bids for Land in \$</u>		
.00	(150)	100	62
.01	(100)	80	56
.02	(75)	68	50
.03	(60)	56	45
.04	(51)	50	42
.05	42	(44)	38
.10	25	(29)	28
.15	18	21	(22)
.20	14	17	(18)
1.00	2.94	3.84	(4.65)

Ag. E. 468, Feb. 15, 1962

1. Next wk.

2. Pass out interest-elasticity sheets. Mention tax rate behaves exactly like i.r.
(as does $\% \Delta V$, if constant in perp.)

3. Run thru tax capitalization.

4. Macro-e. imp. of turnover. Wickrell.

Fn. of hi i.r., eases on cap. by speeding turnover

Fn. of hi rent & l.v., same.

Savings of l.v., effect on turnover

Control of money, limits on: ΔMV , w/o $\Delta T \rightarrow \Delta P$

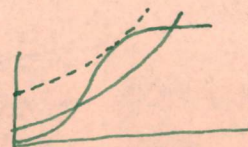
5. Timber

Mgmt. approach best to emphasize, most flexible, bcs. next is probably higher. $g' = g i + a = (g + v) i$  Max. time-ave of $g - c(1+i)^T \frac{i}{(1+i)^T - 1}$

Inf. series approach also good, comprehends all future shortenings.

6. Fisher:

$$g' = g i \quad \text{Max.} \quad \frac{g}{(1+i)^T}$$



7. Bldg. (McKean)

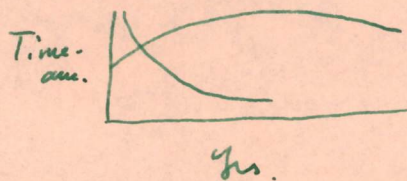
$$\text{Max. } i_B ; \quad g' = g i_B$$

8. Forest Service:

$$\text{Max} \quad \frac{g}{t} \quad \text{or} \quad \frac{g-c}{t} \quad i=0$$

9. Old bldgs.

$$R_m = a \quad p. 74$$



Haskells formula

$$V_p = \frac{A}{\frac{i}{(1+i)^n - 1} + i'}$$

Ag. Ec. 4.68. Schedule.

15-383

Date	Session No.	Topic
2-8	1	Review theory from 386
2-15	2	Fund. maturity
3-1	3	Ec. Devmt in w-n Eur., I
	4	" " " " " II
	5	" " " " U.S. I
	6	" " " " " II
	7	Cycles, exemplified by 1837
4-26	8	Effect of our Ag. policies on resource devmt. Saw-tooth supply.
5-3	9	Aggreg. Ec. anal.: growth, cap. fruct., cap. turnover; employment
5-10	10	Optimal planning of p.w. (distrib. organisms) (Use "Land & Rent in Welf. Ec.")
5-17	11	International & interregional problems of ec. devmt; balance of payments; cap. flows in balance of payments; instability; turn to protectionism
5-24	12	Resource devmt & internat. reconciliation.
5-31	13	Less Less developed countries; & U.S. relations to them.
	14	Land tenure; lack of money ec. -- feudalism;
6-1, Fri.	15	10-12 aM Final Exam.
	16	

Assignments on Ec. Devt., possibilities.

Cl O Hirschman, Strategy of Ec. Devt.
vs. balanced growth.

Ed Mason, Ec. Planning in Underdevd Areas.

Kurihara, Keynesian Theory of Ec. Devt. . Sounds good, to
abstract formal models.

1. Review essentials

2. Turnover of capital, & macro-econ.

a. Timber

b. Depreciating assets. Roles of rent, & interest

d. Developmental instability
e. Typical public policies as part of cycle.

c. Turnover of capital, & employment. Instability of land prices, effects.

→ (Minting. Turnover by purely monetary means, w/o ag real turnover on old lands, brings in new lands.
(e.g., outag. program)
f. Cap. fintr.; cap. migration (& intl. balance of payments.) (Movement from ag. to industry.)

3. History of ec. devmt.

The sequence: politics; commerce; industry. { Mercantilism: Montone; List?; etc.)
(Rostow)

4. Policies for devmt. (& renewal)

~~The~~ Resource availability: land becomes an article of commerce.

Released by a, State; b, sleeping giants. Must be a, Equal divn. of assets;
b, Low land prices, relative to net inc ... hi capn. rates.

Wide mkt.

"Natural zoning". Area specialization. Calif. case study.

5. Issues

How far use the mkt? Role of zoning

Resources & devmt.

Relation of capital supply to employment, via. rate of turnover.

Take this app. to develop that line of thought.

Nothing hard. Begin w. timber.

Shorten rotation, put more men to work w. same capital & land. Cite Wickell, maybe Mill.

If l.v. rise, speed turnover. Thus employ all people on given land, no problem. Likens of cap. supply. Problem is devmt. cycles.

Course planning.

Integrate early phases w. Nat. Study Group

ag. & cap. fmtn.

E.g. in indl. rev., any study of how much cap. came from ag.?

Location of production

Calif. case study: area specialization.

Utah " " : communism, or group settlement

Good Topics:

Uy. zoning, excludine.

McE. vs. zoning

Resource Ess & Devmt.

1. Review basic theory
2. Review history of devmt
Indl. revn.
Westward expansion.
3. Advance theory some: R.F.F. paper.
4. Capital formation
5. Interdependencies in development

Do history in 3 weeks.

1. Ec. devmt. of western Europe
2. " " " " usa
3. " " " " Japan, Russia
4. Current problems in less developed areas.
- 5.

1. Contrast the Farris & Faustmann solutions to the problem of financial maturity

2. Does Stigler's analysis of capitalization indicate that durability of capital goods

2. How does Stigler define "capital"?

... .. "depreciation"? Would his method of depreciation ~~re~~ recover all the initial value of the capital?

How is ^{capital} value affected of assets of short & long durability affected by doubling interest rates? ~~Does~~ Stigler's allow for this? method consistent w. your answer?

3. What is "efficient" farming?

4. Discuss the role of interregional capital flows in the process of resource development.

5. What is Hayek's thesis of theory of business cycles?

How ~~can~~ ^{might} land development fit into the theory as an influence on the "structure of production"?

6. Schmoller and other economic historians tell us that many towns deliberately behave monopolistically. What kinds of policies ~~do~~ they have been used? What local tax policies form of property taxation must effectively help a town exploit its monopoly power?

7. What is the prin. of relative backwardness?

Give 3 e.g. from Eur. hist.

8. Outline the canal boom of 1825-37.

Why did it burst?

Time & space — does received theory overlook them?

= mgnt princ.

Excess burden

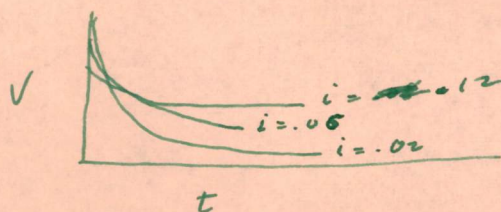
Relation of space to decreasing costs

Tax capitalization.

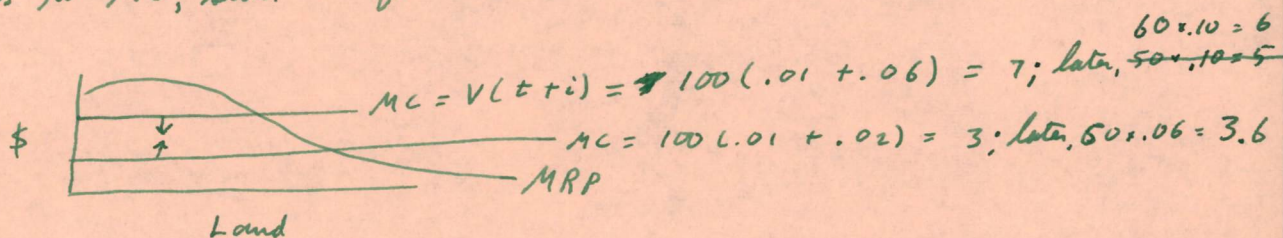
$$V = \frac{a - T}{i} = \frac{a}{i + t}$$

$$\left[\begin{array}{l} \text{Effect on mc of holding title, of ad val. tax} \\ MC = T + I = V(t + i) = \frac{a}{i + t} (i + t) = a \end{array} \right]$$

But taxes not fully capd, bcs land shifts hands, to higher a.



as to MC, sub. T for I

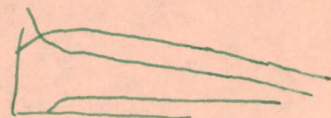


MRP, define

Why "atomistic" land holder?

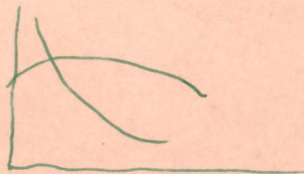
Why equal intensity? Only avoid if no critical max., a flat-topped MRP curve

scale & intensity



Rent as temporal constraint.

Take from future.



"Time-coverage": $\frac{i R_t}{(1+i)^t - 1} = a$ for one year's R .

$$a = \frac{i \sum R_n (1+i)^{t-n}}{(1+i)^t - 1} \quad \text{for many years.}$$

$$a(1+i)^{t-1} + a(1+i)^{t-2} \dots + a(1+i)^0 = R_t$$

$$a \frac{(1+i)^t - 1}{i} = R_t$$

$$\sum = \frac{r - r^{n+1}}{1 - r} = \frac{(1+i) - (1+i)^{t+1}}{-i}$$

$$= \frac{(1+i)^{t+1} - 1}{i}$$

$$\sum = \frac{1 - r^{n+1}}{1 - r} = \frac{1 - (1+i)^{t+1}}{-i} = \frac{(1+i)^{t+1} - 1}{i}$$

5-17-62, Part II. Wanting on risk, credit, taxes.

Ch. 8 - Uncertainty

W. is a man seeking very simple summaries. Gets too simple.

Range instead of $\frac{\pi}{8}$ etc., absurd. Didactic manner, much evas. on analysis.

Neg. pref. for uncertainty? Dubious. Casinos, miners (propinquity of the 2 no accident.) Lenders object, but one-way risks. Also, is a pref. for regularity, not same as averting risk per se.

Gaf.

Risk implies time lag between irreversible commitment (or invest) & out come (lign.) Borne by investor over life.

W's major point: uncertainty discounts are 2d power fun of time, more potent than int. I disagree. Are as many optimists as

pessimists, & periods of overvaluing future as common as undervaluing. Many confirmed Malthusians.

As to the 2d pow of time, etc., b.s. Timber, e.g., long life gives option of many yrs in which to choose most favorable one to liquidate. Land, ups & downs of many yrs even out.

Etc. Low leverage, key to certainty -- but it lets you plunge.

Low i.g., a false certainty. Probly W. getting around to rationalize so i.g., but n.g., bcs if improvements are uncertain, so is land's future rent. He never develops. And ?

Ch. 12 Credit

Internal i.r. Credit W. w. emphasizing that. They differ

Postulates "fixed charges" threaten consn., from Ch. 7. Ch. 7 reveals he has in mind by "fixed", sticky lagging charges that hold up in depress, obnoxious equities. p. 108

Wants payments to vary w. income (But then must pay higher i.r.; & must be criterion of who's at fault when inc. falls)

Wautrup on Taxes

ch. 13: Taxation

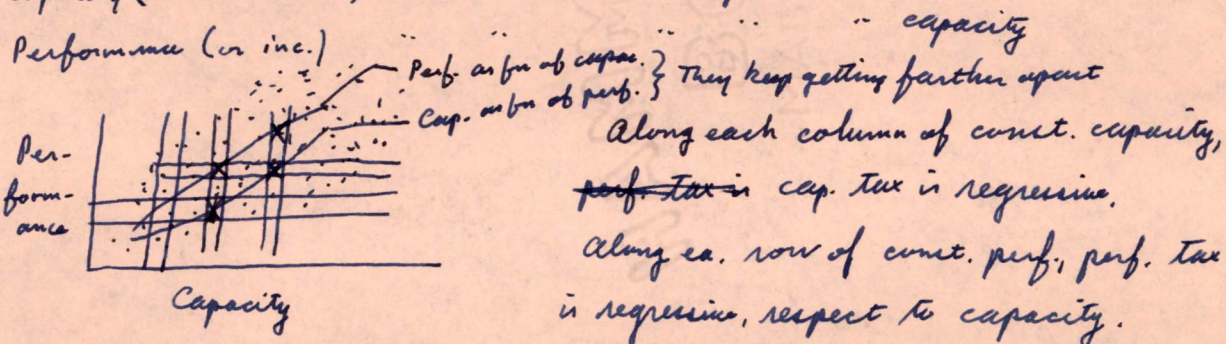
Gurly favors 'progressive' taxes over 'fixed charges' or potentiality taxes.

But Terminology is fuzzy, keeps from us the concepts we need for full anal.

a. 2 kinds of bases: capacity, whether latent or utilized performance

b. "Regressivity" as affected by the regression fallacy.

Capacity (or asset-value) base tends to be regressive re performance (income)



'Regressive' may have several meanings, & W. fails to distinguish carefully.

Finally labels govt regressive on its own base, but fails to dist. concept from
 ans. practice: fails to apply same ~~same~~ standard to performance taxes,
 which are on balance regressive in practice; & alleges untruthfully
 that govt is usually regressive — H. D. Simpson, whom he cites,
 denied it, Welch denies it, etc etc.

W. implicitly uses regression fallacy when refers to flat-rate taxes as "regressive" — he is switching to performance base.

Use analogy of tube of paste or jelly.

Each yr, mgul liq. value shd fall to replaced value. But supranat extraction yield rents.

(In practice, you don't come to end of tube suddenly in yr t , but gradually, & so you are reducing value by something more than $\frac{L_t}{(1+i)^t}$.
How much? Let L_n be Liq. value, year n . Value of mine is $\sum_{n=0}^{n=t} \frac{L_n}{(1+i)^n}$

Toothpaste tube method reduces value by $\frac{L_t}{(1+i)^t}$. But if decline is

gradual, then decline of value is $\frac{-\Delta L_1}{1+i} - \frac{\Delta L_2}{(1+i)^2} - \dots - \frac{\Delta L_t}{(1+i)^t} = \sum_{n=1}^t \frac{-\Delta L_n}{(1+i)^n}$

$$= -\Delta L \frac{1 - (1+i)^{-t}}{i} \quad (\text{assuming const } -\Delta L)$$

Value of t is determined by $\frac{-\Delta L}{L}$: $t = \frac{L}{\Delta L}$

But the smaller is $\frac{\Delta L}{L}$, the smaller is replaced value or depletion.

If $\frac{\Delta L}{L} = .01$, $t = 100$, depletion $\approx \frac{-\Delta L}{i} \approx 20 \times 100 \text{ of } L \approx .20 L$

If $\frac{\Delta L}{L} = 1$, $t = 1$, deple $\approx 1 \frac{1 - (1+i)^{-1}}{i} = 1.00 L$

Use rate shd be extended to $MRP = MC$, and depletion, mixed as replaced value, be part of MC — (or all of it, if MRP is net of other costs)

Now comes progr. tax, cuts into inc. ($= L - \text{Emplaced Value}$), encourages lengthening span of use, ties up capital in the ground. Esply for hi brackets. Also bcs can get cap. gain by selling — thus tax is lower & later. (Note, progr. tax also tends slow inventory turnover, to spread inc. over more yrs; & ~~the~~ bcs. int. is deductible, is less a burden.)

But what does law define as depletion of mines? Not true depletion, but some % of gross sales, ~~much~~ much more than depletion. Also other costs, & exploration. So this activity is virtually untaxed.

Since others are, is subsidized. So gas is too cheap — another xptn subsidy, making us spread out too much.

Yield tax, or seigniorage.

Reduces L , or is subtracted. $E_0 = \frac{L_0 - T(L)}{(1+i)^t}$

Current L_0 also reduced, so produce less each year, bec. higher tax cost, current. Offsetting, is lower depletion, lower by $\frac{T_0}{(1+i)^t}$, but since current costs are higher by full T_0 , is not much offset. Net A cost is

$$T - \frac{T}{(1+i)^t} = T(1 - (1+i)^{-t}) = T\phi$$

So distorts by lengthening. Distortion is reduced by tax capn, note, Wanting to constrain.

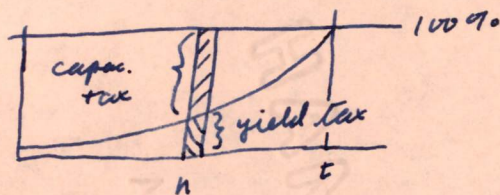
Ad val? Try annual basis, toothpaste tube analogue. Ideal tax wd. be on capacity. Assessor wd. know capacity inc. ex. yr., & for how many yrs. Wd. establish such tax, & wd. remain, regardless of owner's performance.

Ad. be re-evaluated annually, as new facts about mine come to light.

Comes down to an annual capacity assessment. — capac. to yield income net of depletion.

Every year you fail to realize potential, you lose out. Bec. next yr. is reappraised, & capacity has not declined, so you keep paying on hi initial capacity.

Probably best solution is combo. capax. & yield tax. Yield tax = true depletion. Early yrs, hi capax. tax, lo yield tax; terminal yrs, v.v.



Thus, over life, society recovers full initial value by yield tax; & full excess of Σ revenues over initial value by capax. tax.

Is no hastening to avoid capax. tax, but run into higher yield tax. No loafing either. Tax takes over role of i.v.

Needs much elaborating, but worth an article: "a Proposal for Optimal Taxation of Mines." (or "Geologic. Funds.")

Proposed ^{capax. tax} not ad val. on fund; but probably is identical in result.

W's reasoning based on ad val. tax. you seek to min. no. of times you pay. My proposal. capax. base is current income potential, not value, (b rate is much higher of course.) But same objection wd. hold. Need yield tax in conjunction, to offset.

Thus, early years, incentive tax to mandate liquidation (opposite of freezing) or melting of ~~new~~ supranat'l geol. funds, vitalize their latent income-yielding capax. Later years, capax. tax recedes to a mere interest-surrogate, to compensate for lack of same, due to capitalization of yield tax.

Thus W.'s objections to capacity-tax can be met by joining w. depletion or ^{severance} ~~yield~~ tax. Gillespie has also proposed such for agric.

W. says tax capn. no affect allocn. over time, yet that is mainly what he has been discussing! - he just uses other expression for it. Thus sev. tax is capd. into low present ^{emplaced} value, (tho we have seen that is minor offset to primary effect). adval. tax, hastens depletion to min. capn. - very clear. Effect is same as A's. $E = \frac{L_n}{(1+i+t)^n}$ $e \equiv \text{emplaced value}$

Argument W. is dismissing evidently as off: tax reduces int. burden, ~~to~~ replaces it, thus no net effect. W/o tax you hasten to min. int. burden; w. tax, hasten no more. Work thru. If invalid, how reconcile w. my genl. argument on tax capn?

W. dimly recognizes force of ~~prop~~ land-capac. tax. But prefers brainwashing & regulation.

Finally, wants to lower assessments on depleted lands. But that rewards depletion. Gaffney - Gillespie system lowers assessments, but A's severance tax.

Wautrup, Resource Conservation Econ. & Politics. (Berkeley: UC Press, 1952)

Ch. 8 - Uncertainty

p. 111 Knight's 'risk' v. 'uncertainty' is 'stat. dist.' vs. 'est. prob.-y dist.'
Diff. is of degree, so W. lumps.

p. 112 Range is of primary interest, will use that. (Thus:  there 3
dists. are same to W.) (Or there 2: XX. Or there: X

Assumes preponderantly neg. uncertainty prefs. (If so, why do most prospectors
lose money? Why do casinos pay? ~~etc.~~ Why do most land specs. lose? Etc.)

(Lenders prefer certainty. Equity cap. takes risks, however)

(Note how much more certain is future rent than future inc. from
improvements, which obsolesce. Factor in specn. in fringe areas. Also more
quarry) (also note averaging-out over long pd., offsets uncertainty of single yrs.)

p. 113 Allow for uncert. by a, Discount; b, hedging, pooling, spreading; c,
keep plans flexible.

p. 115-16 Stresses uncert. As v. time, maybe more than W. (st
power of time. Thus wd. rationalize under improvement, I suspect.
(But his current i.g., timber, his uncertainty is current, but over
10 yrs, mean net is much more certain)

p. 118 "Flexibility" means keeping liquid. (Also implies liquidating
nat. res. not conserv'g. He seems to deny this, pp. 118-19.)

p. 120 Hedging wd. stabilize price expectations, help conservation. (I doubt
it. Might $\rightarrow$ higher intensity, i.g. But wd. bring in regular land

Wantrup, 2

"Spreading" is diversification. "Pooling" is by those producing same thing
 either
 1. Is good unless done by govt. - then, encourages depletion by
 encourage expansion on marginal lands. Is vague. (Price supports
 shift real cost of risk from grower who incurr it, cause acreage
 expansion)

p. 126. Uncertainty reduces prodn plans to 10 yrs, where int. alone
 reduces them to 50. B.S.

Chap. 9: Prices & Price Supports.

(Not assigned, but scanned for int'l. ~~on~~ re Meenen paper.)

Nothing.

Chap. 12: Credit.

p. 162 Owner w/o much equity, hi insular i.

p. 162 Fixed charges discourage consn. Cites ch. 7, g.v.

g.v. regressive w. inc., bcs. greater lenders' risk, smaller loans.

p. 163 n. Small owners, more labor-intensive, are $\therefore$ better risks
 bcs have higher % labor inc. to fall back on.

p. 163 Hitler forbade mortgages on Peasant Estates, under 310 acres.

- to prevent fixed charges from hurting consn. W. seems to
 approve genl principle, but not specific more.

p. 163 'Less radical' more is make payments vary w. income. (here is
 where I must come to grips w. W. Also, is good basis for
 jnl. article, means to get unwieldy time-dimension ideas
 right out. W. supplies internal i. concept, go on from there.)
 (But vrble payments mean lender shares vrtus, will ask higher i.r.
 Esply bcs. he stands to gain nothing, is no + risk, just less regularity.)

p. 167 On w-n ranges, no. of cattle is often collateral. & lenders object to reducing nos., thus aid's depletion.

Chap. 7 — Int., time-pref. & inc.

(Scanned by W. cites it as authority that fixed charges cause depletion.)

Is good chap. to cite as authority on 'internal' i.r. ideas, in main pitch.

Imperf. credit mkt make some deplete too much, but others conserve too much. (As on balance, problem is not too much depletion, but miscalcn. of it. But I qn. if lo. i.r. indiv. conserves more — buys land more, rather. Show that in class.)

p. 108 Concerns of "fixed" charges as one that fails to fall in depression. Thus gets deplet's effect. Also, p. 107, concerns as regressive w. income, (altho. wdn't apply to land tax.)

(Gives no heed that progressive taxes tax conservation!)

Chap. 13: Taxation

(He never makes several vital distinctions. In rem & in personam; contingent & non; capacity^{or latency} vs. performance^{or activity}.) (Regressive v. flat rate — implies latency taxes are regressive. ... is implicit regression fallacy?)

p. 171 Progressive taxes (on performance) cause =n among yrs — i.e. less variable incomes. (Bids vs. plunging, vs. hi i.g.) (but how about loss offsets?)

p. 171-2 Prog. (perf.) tax delays depletion of stock res., to spread out inc. (but not if depln. is exempt.) Good pattern he sees, prog. taxes help conservation. Doesn't say that is good, but surely wd. leave that impression — doesn't say they deviate from cc. use rates, either.

p. 172 ^{immature} W. timber (which he erroneously calls a flow res.), progressive inc. tax might accel. hvt. - doesn't say why, but I suppose bcs yields of last few yrs are cut into by taxes.

p. 173 Preced's effects exist regardless of type of taxes. Thus he accentuates his position, & is bull.

Tax capn. does not affect allocn over time, will ignore. B.S.

p. 175 In ag., many ~~current costs~~ ^{current costs} ~~can~~ ^{can} be called current costs, deducted immediately, & the inc. is deferred, & may come as $\frac{1}{2}$ -taxed cap. gain (or untaxed, if rebuy fm.) Lists leveling & terracing, reseeding of perm. pasture, enlarging irr & drainage systems, planting trees (for forestry?), fencing (clearing? - probly), & gradual improvement of roads, bldgs & equipment.

Timber gets cap. gain if owner sells stumpage. O-optn. can get it too, maybe - is vague.

p. 176 Depletion allowances

Mining, tax privileges:

a. During 'developmental' stage, all costs are current same excess over gross receipts. W. oil & gas, that includes ~~of~~ receipts of taxpayer from all sources

b. Depletion allowances, $27\frac{1}{2}\%$ for oil & gas
23 sulf.
15 minerals
5 coal

(& it comes right from start, when actually is neglig. depletion value, on roothpaste tube principle (take one to Semin.))

5

Result is faster discovery & withdrawal. Cheaper oil. reduced substs., reduced imports, etc.

p. 178 Hoskold formula is used in mine valuation. [See Osuno, & for Baxter, Chas. H., & Roland D. Parks, Mine Examination & Valuation 2d ed., p. 126.]

p. 178 ad val. taxes on fund res. hasten depletion, to reduce no. of times a value is taxed. ad val. tax affects same as i.r. (Isn't that tax capn. affecting time-dist. of use?)

p. 179, illustrates w. a crude, simple-minded 2-alternative numerical e.g. (that ignores tax capn., suggesting severe limitations of W's mind.)

Tax capn. will not ~~delay~~ offset depleting effect of taxes. p. 181. [Seems right, but glosses over all interesting angles of it.]

p. 182 Recognizes force of property tax to force better use, but regards as 'slow & uncertain'. Prefers brain-washing & regulation. p. 183.

p. 183 Regressive assessments - he assumes them universal, [the one citation is to H.D. Simpson, who did not find that.] [Welch denies it in Calif. - etc.]

Regression → depletion --- he says he has already proven, I doubt.

Objects to "overassessing" depleted lands, says leads to more depletion. Overlooks altern. is to reward depletion w. tax cuts, which elsewhere he calls cause of depletion.

