R/T Seminar, 4-26-12
Environment & Employment

~~[illegible]~~ R/T Seminar 4-26-72

Environment & Employment

I. List of postulates, developed previously. Not to be discussed or questioned.

A. Free ec. tends to opt. level of full empl., under any set of constraints. Unempl. results from instl. bias. ∴ can adopt any constraints for environment, still get full empl. Can employ unempl. to clean up, or prevent pollu, & have no macro. obstacle. Not reduce output of other goods.

B. Micro view, full empl. achieved by subbing labor for cap. This means faster payback.

And subbing labor for land. Means more intensive use. and also faster renewal.

Boondoggling, as in Ts. oil, is not make-work. Is cap. intensive: Slow payback.

C. Macro view, full empl. achieved by higher gross nat. demand for labor. Achieved by faster ~~recov~~ payback on invts., and reinvestment. Think of it as recycling capl., where the yardstick is value. Also solves infln., by ∆s flow of ripe goods.

This is consistent with (B), Micro.

Also achieved by using land more intensively.

D. Now, cap. is scarce, labor unempl. Need to sub. labor for cap.

Land is also scarce. Rising prices. Even mtls. are scarce. R/T oversold abundance theme, by terms of trade approach. Omitted hidden social costs & subsidies to primary products: to explt, depletion, cap. gain, xptn, appropriation, env. ~~[illegible]~~ costs;

and above all policing

Also omitted forced cons. aspect. E.g. even if gasoline is cheaper, we must now use more to accomplish same ends. Even if cement is cheaper, ditto. Even if lumber were cheaper, codes etc. now force us to use more floor space. Even if fuel were cheaper, we are now forced to heat more space.

∴ need to sub. labor for ~~raw~~ primary products; as well as urban space; & faster soils.

Ag labor reqmts. of prodn. doesn't reduce, but ds empl. High labor cost is an imaginary problem (Cover)

E. Growing Consumption of Traditional goods not required for full empl.

Can produce same flow of what we now call "goods" w. more labor, by subbing labor for land. Use less land — save it for recreation. Use less environment — save it for health & pleasure.

This is producing more welfare. The labor is not wasted. It subs. for land, & the land has other uses.

Regression analysis, ultimate problem looming in distance (Cover)

F. Territorial Expansion not required for full empl.

Either urban, continental, or global.

Tert. growth is cap.-using. Soaks up cap., slow payback. Even military, is cap. intensive.

an illusion, chimera, bogey.

Instead of 2 problems there is one solution. I.e. instead of unempl. & pollu., can put the unemployed to work fighting pollu. Just have to use free mkts, watch as it subs. labor for cap. & land.

Cybernation hippies Labor even more extreme. was obsolete.

was always overabundance. How get people to consume it all, and how to invent unless they foresaw greater future cons.

They did not foresee scarcity bec. they did not distinguish land & capl. Capl. was creatable indefinitely, and so ∴ was land.

Social instns. treated land as free good. Ec. anal. mirrored this. "Effic." ≡ AP of labor, achieved by wasting land.

Now, wasting land is becoming a threat several ways. Can use labor to save land.

Now neo-Malthusians scare suddenly succeeding Great Luddite scare. Cybernation Freaks. Popular panics careen from one doom to another. But there is a balanced solution: sub. labor for land.

G. Lower w.r. is simple-minded way to sub. labor for capl.

But key is to make labor ~~for~~ cheaper to employ, – & cap. & land dearer. E.g. by removing payroll tax; and raising property tax.

Great leverage, intensifying land (i.g.) and speeding up payback.

H. Land not an absolute constraint on empl.

When land & nutrls. get scarce, we ~~needs not land~~ substt. ~~But~~ This ~~is~~ soaks up & freezes capl., ~~also~~ the way we have done it. But it can be made labor-using. ~~in wider environment.~~ Full empl. doesn't depend on abundance of res. It depends on how flexible we are at changing factor propns in response to new balance.

When env. gets scarce, can also use labor & capl. to economize on it. And can make it labor-using.

Eye. ~~Instl.~~ e.g.s developed ~~for~~ showing instl. bias.

1. Taxation
2. Forestry
3. Urban land
4. Minerals
5. Agric.
6. Water
7. Effluents
8. ~~Warfare~~ Military
9. Xptn. – layout in space. Sprawl
10. P.w. in general

J. Other

II. Do full empl. policies jibe w. env. quality?

A. Subbing labor for land

almost complete harmony.

Env. quality much broader than residuals generation.

More encompassing idea is, constraining use of commons.

Charging all activities w. their mgnl. social cost.

Thus, set of user charges to constrain use of commons includes auto chargers on crowded streets, auto death is serious external cost. and parking ~~fees~~ meters too.

There are rents for occupying valuable common land.

Force people to apply labor to make better use of land, e.g. by moving cars.

User charges include water withdrawal charges. Forcing "conservation": full use of better water, thus doubly stopping invasion of wilderness:

a. By using good water better

b. By removing hydro-imperialism motive to appropriate — which is also very cap.-using, due to deferred payout.

Thus, cause subst'g. labor for land; & thereby for capl.

The major disharmony is specious -- apparent, not real, illusory.

It is faster site renewal or salvage or recycling. Apply labor to land more often; apply labor to higher % of land each year. a, bldgs b, forests.

a. Bldgs.

~~Divide~~ Bldgs. have a service-life and a corpus-life (or carcass-life). Latter is longer. Formula is a species of average, although not a simple one. Cap. is recovered year by year; site is recovered only once, at end. (And materials are salvaged then, too, if any.)

Period of carcass-$\frac{2}{3}$ life beyond major service life, describe loosely as geriatric stage.

To speed renewal or site-salvage & recycling, cut out geriatric stage. (Also, see later, cut some of pre-geriatric stage)

The very name of site-recycling indicates what this achieves. Substitute renewal for expanding onto new land: urban, continental,

and global sprawl. This foregone sprawl is very demanding of capital, materials, transportation. By recycling site you recycle all assoc. infrastructure, like new gen. or battery in old car.

The geriatric stage does not get much more service from the capl.; but from the land, w/o labor or capl. (except labor of mntce.)

The one apparent environmental cost is minor by comparison. It is the disposal of carcass.

-1 ~~t~~. Some is salvaged, recycled. The earlier the demo., the more wd. be salvagable, altho that is minor too.
The denser the city, the more is recycled. Sprawl prevents recycling.

-2 ~~t~~. Cheaper labor, (to employer) wd. allow more recycling. E.g. in Mo., 1960, old houses were bid on by mgrd. people who scavenged them. Milw., same time, was a net cost to demolish. — unions, further from rural areas, payroll taxes, ~~etc.~~ codes & regs., etc.

-3 ~~c~~. Some recycled for landfill, e.g. Jersey Meadows.

-4 ~~t~~. Since the site is not yielding service, the service is demanded elsewhere.

i. Maybe not supplied anywhere, a net loss.

ii. Maybe supplied elsewhere, at higher social cost, greater social cap. requirement.

There will then be no net decline in materials flow — it will take a larger stock, is the only difference. Larger bath tub, same flow.

-5 ~~E~~ Renew. & constrn. are noisey. True. This should be handled directly w. user charges, standards, etc.

Otherwise, get more side-effects than effects. I.e., if we don't like noise, fight noise, not urban renewal. This will add to R-cost; but also add to lateral xptn. cost, & on balance probably speed renewal.

-6 ~~E~~ Old bldgs., geriatric carcasses, radiate neg. externalities by standing up. Worsen the environment.

~~This~~ MSC is broader than residuals. Is even broader than constraining use of common, and/or creating tenures. Includes neighborhood effects — which are powerful. Rob neighboring sites of value, which means serviceability. They harbor rats. They poison kids w. lead from peeling paint. They are fire hazards. They cause spread & ↑ auto deaths. There are technological external costs.

They have high crime rates — this is more controversial, whether they cause crime, from nat. view.

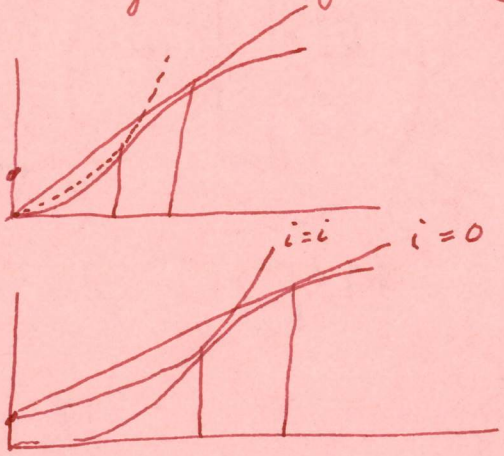
They are absentee owned, as a rule, and that breeds crime.

But geriatric carcasses also are the worst polluters. Old autos, bad combustion; old apts., w. obsolete incinerators, bad furnaces, bad drafts requiring more heat generation. In every polluting indy, majr problem is the geriatric plants: air & water pollu.

And the other worst polluter is transportation, inflated by sprawl. Unsewered area, made unsewerable by sprawl.

b. Forests

1. Faster cutting as such will increase land in forests, by reducing yearly mean growth, by reducing mean growing stock per acre.

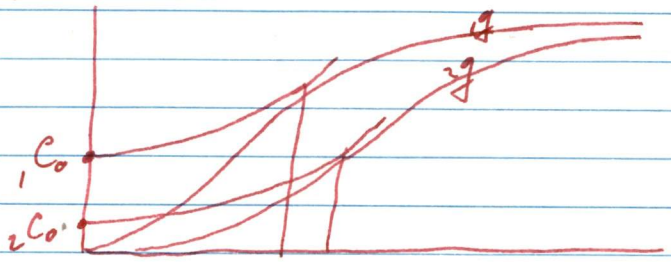


Forest service leans to max. mean yearly growth, regardless of cost.

Applying int. rate & fair taxes, apply less cap. per acre. Thus need more land in timber. Thus do

more to protect watersheds - if take from agric., but not if take from recrn. & wilderness, Moot.
Also generate more wildlife cover. Older forests are sterile.

2. Opt. empl. policy will encourage earlier reforestation: higher C_o, lesser time.



That is, opt. empl. & free mkt. policy results in more frequent use of labor, and also greater use. Higher C_o.

The worst cutting problems are not that land is cut over, but that it is not reforested. Cons. types have been way off base on this, consumed by negative thinking. Fighting vs. fast cutting. ~~and~~ They should have been fighting for quick reforestation.

More capital in early years; less in later years, because fewer years. Capl. spread more evenly over cycle.

More capl. produced by labor; less produced by time of land & capl.

Now the higher C_o will result in higher mean annual yields, and reduce acreages need for forest land. Thus undoing effect of #1, which was moot. ~~But this is often cited last.~~ Can save more wilderness & rec. land from cutting. Can save more redwoods for parks.

3. As to forests taking land from agric., that depends more on agric. the higher use.

The way to contain agric. is to intensify better farm land — reversing present policies.

Otherwise, subbing labor for land is all harmony w. protecting env.

1. Use good land better. Use labor there, and get service. Cut down invasion of wild lands. Immigrants to better land leave behind them great empties of open space, ~~it~~ can't help but shorten Audubon Society's list of endangered species.

2. Go to high i.q. uses. Cherish each square foot, like Japanese or Dutch farmers. Conserve soil — end extensive, exploitive, extractive approach to agric. Contour plowing, terracing, cover cropping, etc., all apply labor (& cap.) to land. Use less pesticide. Have less runoff.

3. Pull in fringes of each kind of land use.

This involves encouraging the intensive uses.

Positive containment.

Cons. types have been negative thinkers again.

Fighting intensity, at every margin of succession.

Wilderness > ~~For~~ Forests > ~~Cattle~~ Grazing > Sodbusting > Irrign. > Exurbs > Subdivns > Indy > Apts > CBD.

Thus, Reading God role. Res. neg. cont. does not contain.

The Cons. types have fallen into this by manning barricades, where higher use is a threat, and misplaced. (also a certain callousness to human needs, mean-civile school, should go away & stop bothering us, stay penned up in the slums, wallowing in crime & drugs which they obviously prefer to outdoors. Contempt for lesser breeds, mask fear of blacks or love for bluebirds, and fear of school taxes as superior esthetic sensibilities -- can be the ultimate hypocrisy.) But assuming good intentions, Cons. types have misperceived the problem by meeting it only at the barricades.

~~They have~~

If you don't like people ~~who~~ living in corn fields, help them live in cities; if you don't want farmers in wilderness, let them use 7a. Etc.

4. Effluent charge, etc. Force use of labor & capl. to save land.

Ala. phosphate case, actually bought citrus land fee for effl. disposal.

Usually just assert a de facto easement, u/c.

Also, effl. charge lets land be used for indy. that might otherwise be locked up to keep out indy.

I.e. it is an alternative to the lockout school of poll. abatement. Lockout school even worse than "new toy" ~~Congressional~~ or Tail-end. Chemlie school, which is biased to use of capl. Lockout school solves problems ~~by~~ of man by excluding man.

(Just a step to Malthusian school which solves man's problems by ~~eliminating~~ ~~him~~ fencing out ~~future~~ ~~comptn.~~ ~~generations.~~ future ~~Stats.~~ Final step is Mabre birth control retroactive, solve man's problems by eliminating him. Far fetched? How do you think ecs. got name of Dismal Science? } Genocidal economics of Nassau Sr. who wanted to starve all ~~us~~ Irishmen -- world wd. be

power for it, I'm sure you'll agree.)

Lockout school now is zoning out 'nuisances' — that employ men. Even some places that want ~~them~~ factories. ~~to~~ As though they never read Essay on Roast Pig. Like BASF AG at Hilton Head. (Also involved (over) Eff'l. charge sifts wheat from chaff. Roast pig w/o burning house.

5. Cut down on war, incl. policing, a great polluter. Lateral expansion leads to war. We reach limits of our turf long before reach limits of the earth.

6. Cut down on use of primary products. Subst. labor. Now, primary products too cheap. Are not made to bear their social costs

a. Env. cost

i. In use. Eff'l. charge stops that. And hiway tolls, reduced hiway bldg.

ii. In prodn.

Effluents again. Processing, refining

here is that every new change forces us to rethink how our society is orgd. — that is the threat.

Hilton Head resists analysis bcs. of what it wd. bring to light. Empl. wd. help large nos. of poor at expense of small no. of rich.

They resist appraisal of damages bcs. that would bring to light how underassessed they are, and how few are allowed to enjoy the place.

primary products is prime source of effluents.

Power use. Refining is big user

Producing. Again, as w. mine drainage, big polluter.

Transporting, as oil spills. Make 'em pay.
Explr. Core drilling, wilderness areas. Charge 'em.

All this cuts down use of primaries.

- Empl. opps. come by subbing labor for primaries. Or using more labor to produce primaries, cleaner.
- Insofar as primaries are complg. to labor, need labor-using policies to compensate.

b. Mfg. cost

Enormous, esply. at margin. Shd. be charged to mineral owners overseas. Would cut out much of our imports, raise price, reduce use.

Mfg. not labor-using, but cap.-using, as indies. go. Boondoggling is not make-work, bes. has to be financed while we await payback, ties up capl. more than labor.

c. Xptn. cost.

Reg. bias, lower rates for primary products & remote areas.

Remove bias, ↑ price of primaries

d. Finding costs

Shared by taxpayers, never recouped, bcs. ΔV ~~are~~ not taxed, while % depln. -- a triple subsidy. Cut it out, raise price.

e. Producing costs.

Depln. allowance. Cut it.

~~All the above,~~

Removing all the biases to overuse primaries will subst. labor for primaries.

And will Δ effic. allocn. of ress. Bcs. are not creating bias pro labor, are removing bias vs. it.

1. Recycling.

Is labor intensive. No resource cost. So cheap labor is the key.

Charging for land is key: clearing site forces recycling carcass.
Compact settlement the key. For low collection costs.

Incidentally, Δ salvage values also shorten lives of sources of scrap, Δ labor use them. Hi parking fees coupled w. hi scrap values would clean old autos off streets.

Again, recycling sites is as important as recycling metals.

Rebuilt products, e.g. generators or starters, are shorter lived themselves.

Utilizing cap. better. eg. fat. cars, is like recycling.

Extending carcass life beyond service life does not cut down flow of resids. except briefly. Have to get service from new products, keep more aggreg. of metals. in use.

II, B. Subbing labor for capl.

Here we run into another specious conflict of full empl. & environment, which I think is mostly illusory.

Subbing labor for cap. means shortening ~~the~~ service lives, & growing cycles. This turns out to be a red flag.

The indictment of shortening lives has several elements

1. A residuals flow through

2. Conniving w. planned obsolescence, which everyone knows is wasteful & a symbol of ~~evil~~ not caring about consern. (Underapprecn. of lead obsolescence, its costs, the waste of subs capl. in unwanted things.)

3. External costs of demo. & reconstrn.

4. Lurking suspicion that I am proposing broken window fallacy

5. Lurking feeling that ~~the~~ longevity comes free or cheap, but is being perversely overlooked & should be encouraged.

6. Assuming I mean more cars when I mean p.w.

(Releasing cap. from p.w. wd. allow lower i elsewhere.)

7. Durability has good connotations. Quality. Wealth. Tradition. Status, ~~Quo~~ & Status Quo.

(But also bad: snob appeal, mustiness, obsolescence, stasis, etc.)

Status is Stasis.

Is some substance to indictment. But not much. And on balance, SR works strongly for good env.

1. The longevity in question is not that which comes free, a cheap. If you can make something last twice as long at little extra social cost fine, do so.

I join in condemning mupies. That raise price covertly by lowering quality, of which longevity is an element. Here the solution is — if you don't like mupy, fight mupy, not turnover. You will quickly find that mupies go in for most durable assets, on the whole, turn very slowly. So fighting longevity fights mupy.

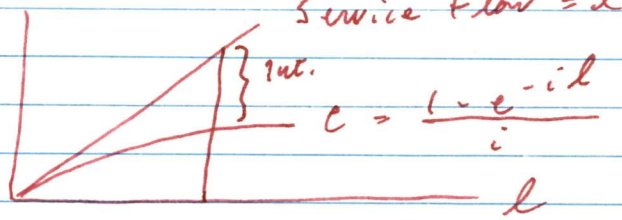
I join in deploring meretricious values, & advertising that panders to them. But warn vs. temptation to impose personal judgements on others. Econ. can legitimately gripe about laws that bias. But is on much shakier ground when ~~critic~~ speaks of social suasion in same terms. Must distinguish. Is Planned obsolescence bad? Forced obsolescence is bad. Depends on who plans it. ~~On balance~~ Mupies & govt. may be condemned; human factors are king. We already have forced longevity or planned geriatrics on balance.

In free market

If longevity is free or cheap, prices fall to reflect it, demand rises, it is exploited. good.

The issue here is discretionary longevity which comes at added cost. You give up 2 one-year service modules (SMs) to get one 2-yr. SM. Set SM in series rather than in parallel.

But in eq. you get a net gain by hooking SMs in series. By doubling cost, you can more than double L. That is productivity of capl.



Normalize. Build one a year, get service of $\underline{l}$.

~~(And covers $\underline{l}$ acres, if each one occupies one acre --- a hidden resource input to bear in mind.)~~

The int. reps. agio, or extra $ from capl., due to longer life.

For most goods, there is negligible gain here, bec. of short life. I.e. to double life from one ~~[illegible]~~ year to

2 years, must nearly double cost.

Indeed, there may be no gain at all, because the added cost may be in the form of materials: same labor, imposed on heavier materials. So from bamboo & plastics to metals. More study needed, but this strikes me as the rule. 'Flimsy' things contain little material.

There is a substantial gain for longer lives. A gain in service flow from given labor & materials. This is the gain in gn. - a gain of output w/o a gain of empl. or mtls. flow. So there is a gain.

But it leaves unsolved the un-empl. problem; also piles up cap. on a few sites, leaves undeveloped the flow of services from much land. So looks further.

2. The reason $\Delta R \rightarrow \Delta$ resids. is bcs. it solves un-empl. problem, which is the object.

The Δ resids. come from Δ empl., not from ΔR. If Δ empl. w. const. R, wd. require more cap.: same flow through a bigger bathtub.

Then you would get: more output per man
higher cap. share (modified by lower i)
less resids / output

But same resids / man employed.

And probly more resids / man when add reductions of salvaging; and Δ use of heavy metals; and look at appreiz capl. (next)

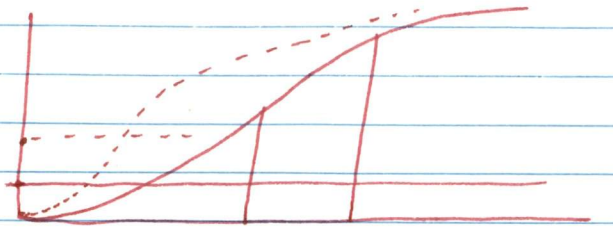
To Δ empl. w/o Δ resids, we must sub. labor for materials in prodn at (& to) salvage & recycle.) Shorter life probly causes that. Heavier primary prods. certainly mean that, and that is the great object toward which this is leading. Primary prodn. is most cap.-using & land-using of all.

3. Appreiz. capl., short life reduces resids.

W. depreiz. capl., long life means more output from given C_o.

W. appreiz. capl., the reverse. Short life means you get less material per unit of labor. also less per acre.

a. Forestry



When you go to higher C_o & quick recovery (dotted line) get much less material per ~~acre~~ man. (Get more per acre.)

Since forestry is cap. intensive, opt. policies will mean less land in forests, too. Forestry constrained as well as modified. Less primary material to handle.

Most appreig. cap., ~~which~~ creates ~~most~~ primary materials, is cap. intensive, will be reduced.

b. Minerals

Highly cap. intensive. High R:O. Long lead times. High social overhead cap. Recap. p. ___.

4. Intangible cap., no problem

a great deal of cap. inv. is intangible, has little effect on cash flows.

R & D; educ; advertising;

Explo – ~~is~~ partly intangible

Mfg. – " "

Approps. " "

Cut down lead times here, simple ecs. of value, not needs.

5. Obviating ~~other~~ outrages

If SR achieves full empl. forestalls all the awful things we do in name of empl. – like allowing pollu., Wallich pro SST for export, etc.

6. SR also goes w. more men/land.

Faster cap. replmt. means faster site renewal, even though they are not identical; and assuming we can cut short geriatric stage to recycle site.

More man/land means less pressure on nature, ~~the objective.~~ Avoid invading environment.

On other hand, higher R means less pile up of cap/land, releasing cap. to spread out wider. This fructifies flow of service from more land, yielding 57 w/o materials flow ... probly good, but needs more work.

7. Cut out appropriative raids on subsurf. land, most longevous inv., no payback to society, only to appropriator, purely acquisitive.

8. General principle:

Most longevous invts. are those that invade nature. Needs developing.

Developing rngld. land is cap.-intensive. Esply. pub. cap.: extending roads etc., draining, watering, flood control, mily. policing, approp. capl. Speeding cap. R precludes much of this.

These also cause low density, source of most env.

problems:

Costs
Collection costs to high for recycling
Billboards
Sewage dollars absorbed by collection costs
Oil spills
~~Loss~~ Premature invasion by higher uses.

Improving environment includes improving working safety conditions.

And old housing, source of lead poison, rats, allergy etc.

to second-class mail. "Congress has always intended that these informational media be subsidized in the public interest," says Bayard E. Sawyer, chairman of the Magazine Publishers Association. "A large increase in second-class rates would put many magazines out of business." But on balance, Sawyer and most other businessmen tend to take the optimistic view. "All we've experienced so far," he said, "is poor service and a spiral of higher costs followed by rate hikes. The new system almost has to be an improvement."

INFLATION:
The First 'Alert'

When he first announced plans for periodic "inflation alerts" by his brand-new National Commission on Productivity two months ago, President Nixon suggested that the group would serve as an ever-vigilant economic Paul Revere, alerting the nation to the specific causes and consequences of the continuing wage-price spiral. But in truth, the commission—composed of 23 business, labor and government leaders—was less watchdog than handmaiden of the President's Council of Economic Advisers, the group that was to do the real work of surveillance and analysis. And last week, after the council released its first "alert" to a group of 75 expectant reporters in the White House, the almost universal reaction was a big ho-hum.

Instead of meeting the President's promise that it would "spotlight significant areas of wage and price increases," the council offered a stodgy, 131-page dissertation on the history of inflation, with almost as much emphasis on the 1950s as on the 1970s. It all led one economic reporter present to note: "With alerts like that, the British would have taken Boston in twenty minutes."

Down: In part, the mildness of the message may have reflected the Administration's growing confidence that its basic policies are taking hold. Prices, to be sure, are still rising fast; just last week, Ford Motor Co. said it was planning a 5 per cent jump in 1971 car and truck price tags, and U.S. Steel announced one of its periodic price increases, this time for tin-mill products. But there are signs that productivity is improving, and indisputable evidence that the economy is continuing to slow down. The unemployment rate, which dropped in June, jumped again to 5 per cent in July, equaling the highest rate in five years. As Paul McCracken, chairman of the Council of Economic Advisers, remarked, "there does seem to be some evidence that the price level is coming around."

In any case, the Administration plainly finds old-fashioned jawboning simply distasteful. "The purpose of the report," McCracken concluded, "was not to give vent to demonological venom. It avoids lashing out because we had no intention of lashing out."



Steel-plant accident: Safety goggles and hard-toe shoes aren't enough

A Matter of Life and Death

The reminders are everywhere: small signs on grinding machines warning operators to wear protective goggles; big signs on plant walls cautioning "Don't Gamble With Safety." And somehow, the signs themselves convey the reassuring assumption that working in American industry is safe and probably getting safer. The National Safety Council itself asserts that Americans are safer at work than in their homes. But in truth, the signs might well read "Warning: Working May Be Hazardous to Your Health." Materials and processes are becoming more complex and dangerous; safety tends to take second place to speed of production; a lethal blend of carelessness and complacency results in 2 million injuries and 14,000 deaths every year from industrial accidents. Or, as former Secretary of Labor George Shultz starkly puts it: "During the past four years more Americans have been killed where they work than in Vietnam."

Almost surely, Shultz understates the case. The government's own statistics show that the rate of industrial accidents soared by 23 per cent between 1958 and 1967, the latest year for which figures have been compiled. But since only sixteen states cooperate with the Federal government in keeping records, the Labor Department's figures are based on questionnaires filled out by employers themselves. And not all the businessmen, complain such critics as president I.W. Abel of the United Steelworkers union, make honest reports. "If a fellow breaks his leg," Abel charges, "the company will bring him to work in a taxi, give him a soft job, really just let him sit around, and not report the accident." Consumer advocate Ralph Nader, who is preparing a book on industrial safety, charges that some companies go to extreme lengths to suppress sloppy safety records. A large beryllium producer, Nader says, once warned a company doctor that he would be looking for another job if he published a report on beryllium poisoning among employees of the plant.

All told, an AFL-CIO safety committee estimated last week, the official statistics tell only half the story; the true accident rate comes to 4 million disabling injuries a year. And even this figure may be far short of the mark; in fact, a private research firm working for the Labor Department estimates that no fewer than 25 million workers are injured every year —twelve times the official figure—and 500,000 more are disabled by occupational diseases.

Good Earth: Accident rates are highest for jobs involved with wresting resources from the earth. Mining, quarrying, logging and oil-well drilling all exact a heavy toll. Whatever the industry, the most common single killer is the motor vehicle, from the farm tractor to the fork-lift truck in the factory. But the greatest number of job accidents result from falls and falling objects, such as the huge, 450-foot-long pipe at U.S. Steel Corp.'s Gary works that clogged up with sludge and crashed last winter, killing three men and injuring five.

Apart from outright accidents, no one knows for sure how many workers have been struck down by silent killers in the form of corrosive chemicals, noxious fumes and debilitating dust particles that have become commonplace ingredients of the manufacturing process. Because of the high costs of installing safety equipment, small companies with old plants cause a disproportionate share of the disabilities. In Muskegon, Mich., for example, the Lakey Foundry Co. has only 1,000 employees, but more than 350 suits demanding compensation for injuries have been filed against the company. The problem: a thick carpet of silica dust

A Very Special Delivery

Through four separate Administrations, a procession of efficiency experts, management consultants and Presidential commissions has scrutinized the sacred antiquities of the United States Post Office and concluded that the only way to make it work would be to wrench it from the political quagmire and turn it into a real business operation. But there, invariably, the matter has rested; Congress showed no disposition to give up its patronage plums or its right to do favors for 750,000 voting postal workers.

Thus there was a faint air of unreality in the walnut-paneled conference room hard by the Postmaster General's office last week when Postmaster General Winton (Red) Blount announced that he had succeeded in abolishing his own job. Just two hours earlier, the House of Representatives had given final approval to President Nixon's plan to reorganize the Post Office as an independent agency under the executive branch of government—and that, beamed Blount, was "the most far-reaching postal legislation in the history of the Post Office Department . . . It opens a new era—one which will provide better mail service for our citizens and better careers for our employees."

Uphill: For the public, Blount conceded, the first new sign would be merely another rise in the cost of mailing a letter: the price of a first-class stamp, which, from a low of 2 cents in 1919, has been marching uphill at an accelerating pace in recent years, will jump to 8 cents when the reorganization takes effect next year.* But eventually, he said, the new structure means better postal service.

There was still room for skepticism, but an efficient Post Office would be no more startling than the Administration's victory in pushing its bill through Congress. Indeed, when the Nixon plan first surfaced fourteen months ago, almost no one gave it any chance of passage. Congress was in no mood to give up its perquisites, and postal unions balked at the notion of giving up the lobbying muscle they had developed over decades of currying favor on Capitol Hill.

What tipped the balance was not so much White House perseverance as the historic mail strike that began last March 17 in New York City. The strike, which threatened to paralyze the economy, put Congress on the defensive. It made union leaders realize that their cozy relationship with lawmakers was not bringing home the bacon to the rank and file. And it forced the government for the first time to sit down and bargain with its own employees. The final bottleneck blocking the legislation was removed a few weeks ago, when union leaders agreed to drop their demand for a union shop if an 8 per cent pay rise were made retroactive to April 16.

Insulate: The thrust of the reorganization will be to insulate the Post Office from the political pressures that have long hampered its efficiency. Dubbed the United States Postal Service, the new agency will be run by an eleven-man board of governors, nine of whom would be appointed by the President. These nine will pick a Postmaster General and his deputy, who will also sit on the board—and in Washington, some insiders hinted last week that the new chief might turn out to be Blount himself. Postal rates will be set by a separate five-man commission.

No longer a member of the President's Cabinet or a political appointee, the new Postmaster General will have the responsibilities and prerogatives of a modern business manager and will operate under the injunction to put the Post Office on a self-supporting basis (government subsidies will wither away over a thirteen-year period). He will have the right to ask for postal-rate increases if a deficit looms, and to enact them if the rate commission fails to act on his request.



Newsweek—Wally McNamee

Blount: Opening 'a new era'

Perhaps the biggest change, however, will be the new agency's ability to set its own budget and float as much as $10 billion worth of bonds for modernization. With Congress controlling the purse, the system has never been able to update its decaying plant—a major factor behind its ballooning $9 billion budget. Now the closing of outmoded structures, new construction and installation of automated equipment can proceed apace. "Mail will be automatically sorted right down to the sequence of the carrier's route," Blount told NEWSWEEK's Tom Joyce.

Postal employees will also benefit—not only from a healthy salary hike and improved working conditions, but from the chance to advance on merit. Even binding arbitration, which the unions first opposed, is now seen as a blessing. "Most of our people are fed up with running to Congress on our knees," said Herman Sandbank of the Letter Carriers union.

For all these benefits, however, postal reform is not viewed with unalloyed enthusiasm. Publishers of newspapers and periodicals, for example, worry that the self-supporting principle will be applied

*The first letter rate applicable to all parts of the U.S. was set at 3 cents in 1863. Before that the rate had ranged from 3 cents for normal distances to 40 cents for a letter traveling by sea between the East and West coasts. In 1883, the national rate was reduced to 2 cents. It rose to 3 cents during World War I and was restored to 2 cents in 1919.



Courtesy Scott Stamp & Coin Co.

For the mailing public, the first sign of the new times will be another hike in first-class postage

If they carried passengers, this wouldn't happen.

residents of Crete, Neb., when two tank cars carrying the stuff were derailed there last year. Because so many of these hazards involve transportation—and because railroad accidents increased by an alarming 66 per cent between 1963 and 1968—pressure lately has focused on improving the standards of the nation's crumbling rail network. Last week, the House approved and sent to conference committee a bill giving the Department of Transportation broad powers to set new standards for the shipment of hazardous cargoes.

No Hiding Place: But Congress has yet to come to grips with a stringent, effective national industrial safety act. The time may be at hand; at long last, workmen themselves are beginning to clamor for protection. Says an official of the United Auto Workers: "The men have abandoned the falling-object syndrome that used to assume a guy could protect himself. Now they see there are a lot of environmental situations that can't be handled by safety goggles and hard-toe shoes. And they are up in arms."

Feeling this pressure, the Nixon Administration has sent up a bill that would delegate the power to establish and enforce new safety regulations to a five-man Presidential panel. But Congress is divided between this measure and a House bill that would give the Secretary of Labor the direct authority to order companies to eliminate unsafe job practices. Organized labor and the vocal reformers, including Nader, support the House version, while the Chamber of Commerce and the National Association of Manufacturers back the Administration. Because of this impasse, the prospect for passage of either bill is rated slim. But any extended deadlock seems sure to ignite protest among reformers, who see the delay as a plain matter of life and death. "In a nation deeply concerned with human and economic progress," says George Shultz, "such backsliding is a matter for distress."



D. Gorton

Chevrolet's DeLorean and the Vega 2300: A Beetle-killer for GM?

AUTOS:

Enter the Vega

It is, proclaimed Chevrolet Division general manager John Z. DeLorean, "unlike any other Chevrolet ever built." With that, DeLorean introduced newsmen to General Motors' new challenge to the 1.1 million imported cars that swarmed over the United States last year: the sub-compact Vega 2300. And sure enough, the Vega was something new in Detroit's repertory, from its overhead-cam engine to the robot welders on its assembly line. The new car even traveled to dealers across the country in unique style last week—standing on its front bumper in vertical racks in special railroad cars.

The Vega, which will go on sale early next month, has somewhat smoother lines than its principal competitor, the Volkswagen Beetle. At 170 inches, it is 11 inches longer than the VW. It also is 4 inches wider—and 7 inches lower. The Vega will be powered by a 90-horsepower engine, compared with the 57-horsepower engine on the Beetle. GM did not announce its price, but it will be within bargaining distance of the $1,839 list price for the Beetle.

American Motors Corp., the first American firm to market a sub-compact, has sold 19,000 of its Gremlins since they were introduced last spring. DeLorean hopes to sell 400,000 of the new Chevrolet models next year. Ford will introduce its Pinto later this month; the Chrysler Corp. entry is not expected to reach the showrooms until next year.

Wheeling and Dealing

Is it simply a matter of good business, or does something more sinister lurk behind the Ford Motor Co.'s practice of letting important congressmen lease Lincoln Continentals and other prestige cars for about one-fifth of what an everyday citizen would pay? That question—and a variety of answers—bubbled up in Washington last week after the UPI reported that at least nineteen influential House and Senate members were wheeling around Washington in rented limousines for a mere $750 a year.

"I'm one congressman that ain't apologizing," snapped chairman L. Mendel Rivers of the House Armed Services Committee, who leases a blue Thunderbird. "Nobody can buy me for $700 or $800." Besides, he said, he had to buy a whole new set of tires for his leased wheels. On the other hand, Rep. Harley O. Staggers, chairman of the House Interstate and Foreign Commerce Committee, gave up his Continental as soon as the story broke. "When I heard someone had questioned the ethics of the arrangement," the congressman explained, "I turned it in."

An Old Practice: Actually, as most congressmen were quick to point out, similar arrangements have long existed in the executive branch. Relations between Ford and the White House go back to Calvin Coolidge's day (he switched from a Pierce-Arrow to a Lincoln). General Motors and Chrysler also have provided Cadillacs and Imperials, respectively, to top government officials from time to time. As far as Ford's Washington office is concerned, the arrangement makes good practical sense. "Our sales of prestige cars," said a company spokesman, "are much higher in this area than the national average."

Still, the question remained: was the practice justified? Even if the congressmen did no more than serve as advertising, a good many of their constituents would feel affronted. And if the solons returned any other favors, that would almost add insult to injury. "To be sold out for such churlish amounts," wrote Washington columnist Nicholas von Hoffman, "is deflating to the national vanity."

AIRCRAFT:

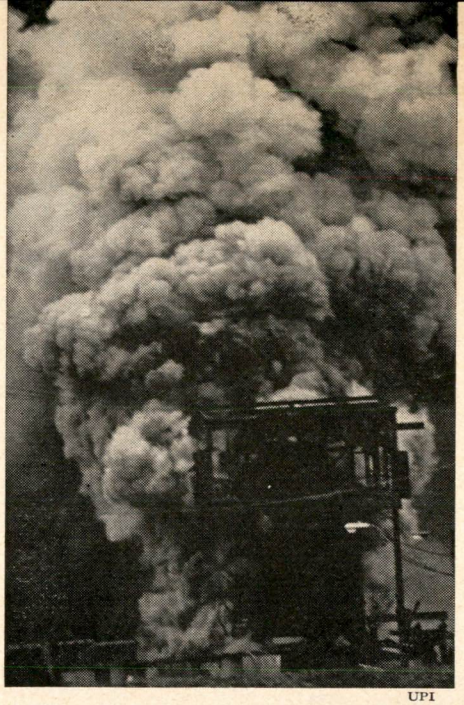
The Fight for the SST

"I've heard it all," sighed aviation expert William Magruder over lunch in a Washington restaurant one day last week. "The supersonic transport is going to modify the climate, it's going to bring on another ice age, or it's going to melt the icecaps. Lord, three major volcanic eruptions in the last 90 years ejected more gunk into the atmosphere than all of mankind's activities. This country needs the SST. If I didn't believe it, I never would have left California."

The environmentalists swarming over Capitol Hill these days would be delighted to see Bill Magruder head back to California and take the plans for the SST right along with him. For as the new head of the Department of Transportation's supersonic transport program, he is a central figure in one of the lustiest Congressional lobbying battles in years. At issue is the impending Senate vote on



The New York Times



UPI

The perils of coal: Fire and disease make the worst record

from the sand used in the casting process. Inhaled over a long period of time, the fine particles cause silicosis, a condition that transforms men into cripples racked by paroxysms of coughing.

The foundry's air was tested in 1945 and found to contain ten times the recommended safe level of dust. Twenty years later the limits had been cut in half, but the air was about as dirty as ever. Lakey president Guy F. Campbell admits that "with the older plants we have it's a problem." But Muskegon lawyer Jerry S. McCroskey has another—and more indignant—explanation. Because the maximum liability of a Michigan foundry in the case of silicosis is only $12,500, plus medical and funeral expenses, McCroskey says, "it has been so inexpensive to disable or kill a man . . . that it has not been worthwhile to clean up."

Silicosis is just one of many crippling and deadly respiratory diseases common to industry. In the insulating trade, estimates Dr. Irving J. Selikoff of New York's Mount Sinai School of Medicine, 8 per cent of all the workers will die from asbestosis caused by breathing tiny particles of asbestos. The disease was identified in 1924; yet when New York City passed safety standards last spring for the spraying of asbestos, it was the first city in the U.S. to do so.

Venal? And this indifference to health is widespread. More than 100,000 of the nation's 1 million textile-mill workers have contracted byssinosis, or brown-lung disease, from inhaling cotton dust, according to estimates made by New Jersey's Sen. Harrison Williams. Yet an article in the American Textile Reporter, a widely read trade publication, dismisses the disease as "a thing thought up by venal doctors who attended last year's ILO meeting in Africa, where inferior races are bound to be afflicted by new diseases more superior people defeated years ago."

Nowhere has the disregard for safety been more flagrant than in the mining of coal, which has been the most dangerous occupation in the U.S. for years. In fact, coal mines have claimed the staggering toll of 80,000 lives since the Bureau of Mines began keeping records in 1910. But even so, Congress did not get around to enacting the first mine-safety law until 1941.

Hobbles: It was not until 1968 and the explosion of Consolidation Coal's mine at Farmington, W.Va., killing 78 men, that Congress was jolted into passing a more comprehensive Mine-Safety Act. With the added disclosure that thousands of miners had been sent to early graves by pneumoconiosis, or black-lung disease, the new act set the first limits on the level of coal dust permitted in underground chambers. But effective enforcement of the 1968 standards has been hobbled by the failure of the Nixon Administration to appoint a new Director of Mines to replace Democrat John F. O'Leary. Although appropriations for the Bureau of Mines were quadrupled last year to $13 million to hire more mine inspectors, Nader charged last week that the agency was actually conducting only one-eighteenth as many inspections as it did last year.

The generally unimpressive industrial-safety record in the U.S. has a good many causes, none of them reflecting much credit on those responsible. Union leaders too often are willing to barter safety for a wage hike. Employers tend to try to coax a little more life from worn-out and unsafe machinery. State safety standards are too often antiquated and ineffective, and there aren't enough inspectors to enforce the ones on the books. Indeed, four states have no safety inspectors at all, and the Bureau of Labor Statistics estimates that of the 1,524 state inspectors in the entire country, only 827 are available for general safety inspection—a third of the number of fish and game wardens in the U.S.

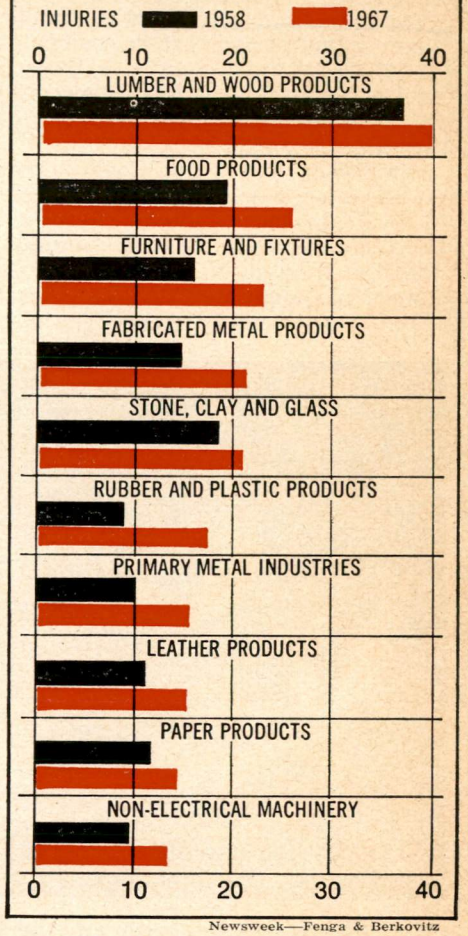
While the record is certainly better than it was 50 years ago, it is clearly not good enough. Nor is it up to the standard of many European countries, where job safety is a matter of national policy. A British factory worker is only one-third as likely to be disabled as his U.S. counterpart. Only one out of every 12,000 Swedish workers is killed at work—lower than half the U.S. rate—and the Swedish accident rate has not gone up since 1955.

Net Gain: By careful planning, a few U.S. companies have set enviable records. Through a total approach to safety, one du Pont chemical factory operated for 45 million man-hours without a single disabling injury. A Houston construction firm spent $90,000 stringing a safety net around the base of a 50-story office building and found the investment paid off in faster production.

And increasingly, safety problems are moving beyond the plant gates. Indeed, the impetus for stiffer standards has been measurably increased by a wave of industrial accidents that threaten the public at large as well as the workers involved. Routinely, deadly phosgene gas is shipped about the country for processing into plastics. Fumes of the common fertilizer, anhydrous ammonia, are lethal, as shown by the death of eight

The Most Dangerous Jobs

In recent years, U.S. manufacturing jobs have actually grown more dangerous. Latest available figures on the number of injuries per million hours worked in the highest-risk industries, compiled by the Bureau of Labor Statistics:



Newsweek—Fenga & Berkovitz

Packaging & throwaway goods accrit of shortest life.
Packaging subs. for clothes, whose services are shorter
Paper towels subs. for laundering.
Charging for disposal solves problem, anyway.

~~Less cap./man is counterpart of less land/man. More freq. use of labor.~~

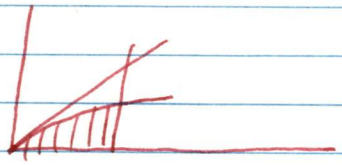
2 ~~ΔR makes full empl. possible, forestalls all the other useful things we do for full empl.~~

4 ~~Less initl. per man std. means less resid. throughput.~~

3 ~~The most longevous invs. are those that invade nature, push back frontiers.~~

The extra service life of capl. means you cover more land w. given cap. by longer life. ... even before geriatric stage.

Keynes & Ayres. But no, the extra life comes from having more cap. on the land at one time. So you cover less land w. given capl.



Compare 10 ayres of one-year life vs. 10 staggered Keynes.

Value of Keynes -- cap. unrecovered -- is area under PV curve.

Value of 10 ayres is = 10. So it takes more cap. to cover same space w. more durable stuff.

So you fructify less of the flowing services of land, by piling up cap. on a few sites.

Thoughts

Env. & Empl.

1. Identifiable "pollu. control equipment" approach is cap.-intensive, biased vs. empl.

Process & product modifn. use labor as well as capl. They adjust to relative costs, like everything else.

So pollu. control is neutral or irrelevant to empl. A red herring. Is something to do for its own sake.

- not as ~~co~~ make work to Δ empl.
- not stifled by fear of reduc empl. by lower costs.

2. Hurt our exports?

a. Hurting exports is not the ultimate evil. Beware balance-of-payment fundamentalism.

b. Is not a nat. gain to sell abroad below cost. Adam Smith.

c. If the subsidy is achieved by underpricing env. inputs, that is still true.

d. Distributional aspect is what's really involved. Exporters who pollute gain from 'reception'.

c. Unempl. anxiety also involved. It is potent.

3. Pollution no longer among top issues bothering voters.

4. Pollu. control as such is neutral in effect on empl. Can be done w. labor, or capl., or land. Depends on how done.

a. Done w. land, by lock-out. The ~~deep~~ deer park syndrome. Ecology, zoning, etc. Man-is-vile school. Hurts empl. – also housing.

b. Done w. cap. by govt. subsidy to specific identifiable "pollu. control equipment". The "new toy" approach. Fast write-off results in this. Also, specific property tax exemptions: bricks-&-mortar bias.

c. Process & product modifn., and other use of more labor.

5. No-growth ec? Growth of what?

6. Fallacy of composition, source of needless concern.

This fallacy means apply partial analysis to general eqm.

Analogy: tax shifted forward, on one indy. - via, reduced supply.
But not a tax on all indy. Doesn't reduce supply in general. Draws resources out of heavier and into lighter taxed indies. & products.

Closer analogy. Price of one input rises. That doesn't mean unempl. unless the input is labor. Means substn.

"Higher costs will put us out of business".

Combines fallacies:

- universal marginality. Kuwait as the other extreme.
- composition. You recombine inputs, reallocate.
- land is costless until you pay for it. Now, polluter is collecting imputed rent.

7. Closing unpl. plants is not a net social cost, by defn.

Cut down on lateral expansion. various kinds of sprawl that invade nature. Sub. labor for nature.

This also cuts down on wa. big polluter.

Cut down xptn., & mily. protection

R/T oversold abundance theme. Terms of trade too simple.

Δg env. cost
Δg mily. cost
Δg xptn. "
Δg finding "
Δg producing "

} all subsidized & hidden.

Didn't appreciate importance to env. of what we developed last time. Can attain full empl. — ec. is flexible.
∴ can do anything for env., no problem.

E.g. China has full empl.

We have imaginary problems, chimeras — that blind us to real problems & their solutions.

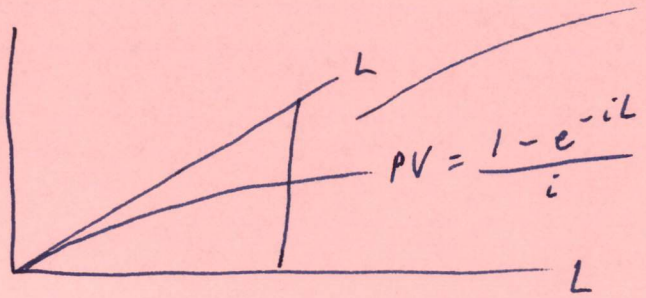
p. 5, 'subs. for finit. exp.' is good

Need policies for growth of welfare, purged of waste, expansion, & pure 'consumption'. (It's not just how much you consume, but what)

Higher costs of turnaround tend to Δ longevity. So some residuals changes wd. tend that way. That's ok — we're seeking an optimum. The resids. changes wd. be selective in a normative, optimizing way; while slow turnover policies in general as anti-residuals changes would have more side-effects than effects. Beware principle of compensating error.

Anti- Proposed ann. tax (N.Y. Bd. of Trade)

- we already have that
- subs cap. for labor
- not the right yardstick for pollu — i.e. some short lived goods don't pollute, & long lived ones do (or save, like Saran Wrap)
- the only way this can cut down flow of resids. is by cutting empl.



Biases to use too much cap. are also biases to invade nature —

exploration

appropriation

Waste of capl. in p.w. etc. means higher i elsewhere. This means quick recovery of cap., slow recovery of site.

~~long~~ short 'life', long after-life. The long after life is polluting: ineff. combustion; low service from land, drives people out elsewhere

---

Boondoggling is not make work, bes. ~~it~~ ties up capl. more than labor.

Recycling

- depends on compact settlement
- dramatizes difference between life of product, and life of material. ~~Trash~~ Cans, tins, etc., is wrongly based on life of product.
- is labor-using
- often produces a shorter-lived product. E.g. rebuilt generators probably don't last as long as new ones.
- being usually profitable, is
  a. Mostly labor
  b. Very elastic to costs, taxes, etc.
- begins w. a raw material ~~that~~ whose value is mostly ~~a~~ the labor-~~product~~ input. No time is required. No tree growth, no exploration, no military. No processing plant, etc.

Non-recycling results from bias vs. labor.

- slow site recovery slows recycling. It means material is tied up unproductively. So more total is needed, overall.

E.g. old cans, on standby. Extending 'life' is not same as extending service. "Geriatric" capitals

"Service life" vs. "corpus life".

is not extending service. It is slowing the salvage & recycling of material and land.

Is important to have utils & land deployed always so they are yielding service.

Extending corpus-life does not cut down flow of resids. To get same service, is now necy. to build a new bldg – elsewhere. End up w. same resids. flow -- using larger corpus of utils.

"Resids" is not the whole ~~pollu.~~ externality problem anyway.

2 other kinds, long corpus-life worsens

a. Crowding of commons

b. Visual &c. externalities: sound, smell.

List biases for using virgin materials. p. 12; and BMS on fr. inv.

Biases to forced conns., cause resids. --- a particular form or caste to "growth".

Political power of resource owners is involved.

Pesticides sub. poison for labor.

Wed.

First, ~~assume~~ itemize policies for full empl.

Then ask if they conflict w. env. Answer no, they permit all env. policies, obviate need for worry re empl.

Can put idle labor to work controlling pollu., and not reduce output of other goods at all. (But then others can buy less of other goods. No problem — pay w. better env.)

Δg labor requirements of produ. doesn't reduce, but Δs empl. Instead of 2 problems, there is one solution. (Fallacy of dividing one solution into 2 problems)

We don't need to make labor cheaper. But make it cost employer less, by removing payroll taxes. (Common for liberal.)

Note ~~glaring~~ contradiction of liberal orthodoxy.

1. ~~Let~~ Reduced demand for labor results in unempl. Wage rates are rigid. Supply is elastic

2. Payroll taxes are absorbed by labor. Supply is inelastic or perversely elastic.

Fallacy of averages.

Define productivity & effic. as AP of labor. Then Δ 'eff' by subbing land for labor.

Lower 'effic.' is higher.

Is 'growth' necy? Where did this idea come from?

Keynes. Growth means cap. formn. Even here, not necy. Less S & more C obviates need.

But in practice, K-ians saw too much S, and need to soak up all this cap. Any inv. was good — recovery unimportant & even undesirable.

Ultimate specter looming in distance was overabundance.

✓ How to find C. This did indeed lead to waste, & growth of C as a good end in itself. They did not foresee scarcity --- since they didn't see land as different from capl, thought all wealth was reproducible.

To keep current thought in perspective, recall Ten yrs. ago the automation scare, neo-Luddism. Again,

no scarcity.

Now, suddenly, neo-Malthusian scare. Popular feeling careens from one oversimplified doom to another.

pp. 7-12, Li R doesn't cause pollu.

Reg. bias turns xptn. into a sort of commons, — or turns better lands into commons, invaded to Tap subsoils. Develop this.

(From RfF seminar, 12-8-71, unused portion.)

II. Needed change, and some concerns aroused

A. Neutral instns.

No forcing of R. Mkt. suffices. Control externalities by P = MC.

B. Concern for the environment. Will neutral instns. hurt the env?

1. Higher density?

Reading: Bad fallacy, of boomers

Fallacy of comp. in extreme form. Higher density in the right places relieves pressure elsewhere.

Neutral instns. wd. probably result in beehives, esp. if control externalities were in.

Use mass systems -- RCMS.

2. Reduced xptn.

Neutral instns. result in less xptn., reduce pollu.

3. Primary products

Neutral instns. reduce dependence on these. Xptn. & primary extraction & refining are 2 greatest polluters.

~~Land~~ Primary products are land & capt. intensive, use little labor, (except military.)

4. Space invasion? Premature land use succession?

at every margin, neutral instns. wd. favor higher use.

But by winning at center, relieve pressure elsewhere.

(Where is the center? Wherever men promote growth — can be Arlington, Va. The point is, not many are needed.)

5. Effluent charge

Subs. labor for capl.

Will it drive land from use? No more than hi rents ~~reduce~~ drive people from Manhattan. They screen out low uses. ~~It~~

Like water tolls, parking fees, congestion fees.

Only tightrope school thinking teaches us worry that the lost plant will never be replaced.

(Also, effluent charge must be geared to damages. A charge where no land would benefit from cleanliness can drive out one, not create new opps.)

6. Repealing rule of capture.
Countless environmental benefits.

7. Is faster replacement bad for environment?

a. Anything that ↓M will ↓ activity and pose possibility of ↓g residuals. ↓R merely tells how to do it using less capt., & requiring less land

b. Re primary products themselves, lag between explm. & use is a big problem of slow turnover, & a pollutes. Neutral instns. use best first, etc.

c. Re Trees,
i. Reforest faster, keep land covered
ii. ↓ land in forests, by reducing mean annual growth, (less growing stock per acre). This is result of earlier cutting, anyway. Higher P works other way.

d. Re bldgs.
i. ↓R means get <u>value</u> out fast, not materials.
ii. Demoln. comes to recycle site, give new life to infrastructure.

e.g. Re cars.

Remove old polluters

Recycle materials

So, move to fight R to help environment is wrong.

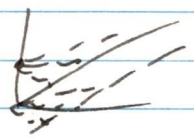
Iatrogenic.

Tom's seminar - topic, Durability and the Environment

0. We already have forced durability
1. Forcing durability creates unemployment.
2. The unemployed can then
   a. Stay unemployed - I rule this out
   b. Lower w.r., thus speeding cycles up again
   c. Invade new lands, requiring new capt.

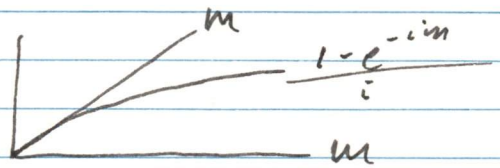
Analytical tools.

a. To show effect of end-point changes on durability



b. To show how much you can Δ service flow from given labor force by Δg durability.

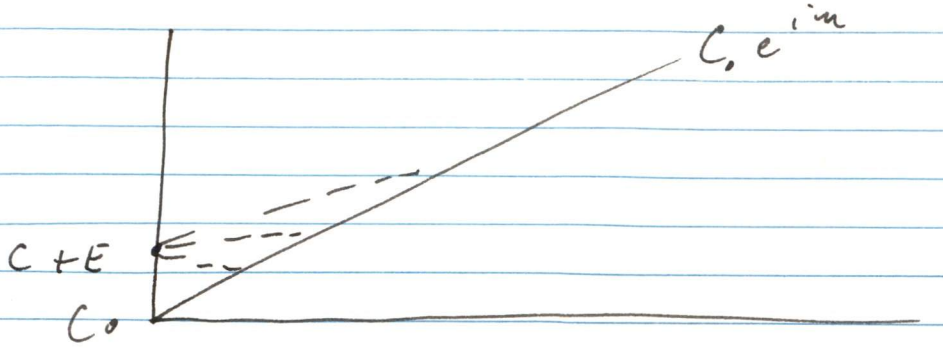
   i. You can't Δ at all w/o Δg K.

   ii. 

Share of labor is $\frac{1-e^{-im}}{im}$

Net gain of output is also gain of int. share

For short lives must double cost to double life, nearly. Take table.



C_0 = cost of ~~costs~~ Payroll and materials.

$C_0 = P$ ~~+~~ + M ~~+~~

E = Premium, or price of materials due to taxes, effluent charges, etc.

$E = Mt$

New Σ cost is $P + M(1+t)$, or $C + E$.

This now adds to durability.

A terminal disposal charge wd. add more, like ex excise tax, only ~~more so~~ ~~for~~ more so here, bec. the charge wd. not be ad valorem. But appreic capl. is not thrown away at end of life anyway, so irrelevant. As to depreic capl., the charge wd. be a higher % of value at end of life, and act toward earlier demolition. — 7 pm.

Relations Among Volume, Turnover, Capital, and Factor Shares

M. Gaffney 12/8/71

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Relations Among Volume, Turnover, Capital, and Factor Shares

M. Gaffney
12/8/71

1. Simple model, inventory

   a. A storekeeper has $100 capital. Each day he spends it on inputs and sells out.

      Yearly volume (F) = $36,500

      Turnover (R) = 365 times a year

      Capital (K) = $100

      Basic Relation:

      $$F = K \cdot R$$

   (Interest of $5. is negligible, when R is so high.)

   b. At other extreme, he spends the $100. planting trees, or finding unripe minerals. At 7%, money doubles every 10 years. In 60 years he sells for $6400., thus making 7% yearly. Mean yearly volume is $\frac{6400}{60}$ or about $107. $\frac{63}{64}$ of the volume is interest. Payroll of $100. is negligible.

      Between these extremes lie most cases.

2. Appreciating capital. The "Point-input point-output" model (PIPO). Site is free.

   a. Single Cycle

      P = Payroll, time zero. (assumed only input)

      m = period between payroll and sale of output, in years.

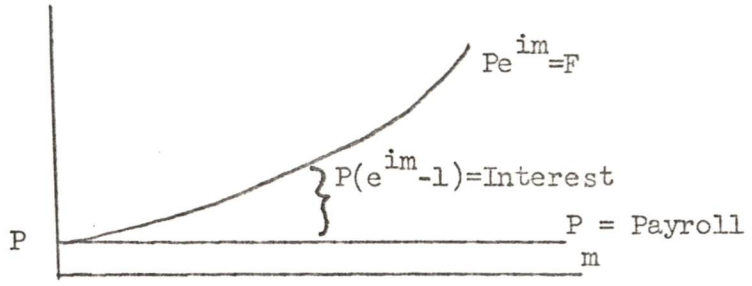
      i = interest rate. (continuous)

In equilibrium, output after $\underline{m}$ years, (F):

$$F = P e^{im}$$

Labor share $= \frac{P}{Pe^{im}} = e^{-im}$, a decreasing fn. of $\underline{m}$.

Capital share $= \frac{P(e^{im}-1)}{Pe^{im}} = 1 - e^{-im}$, the complement of labor share, and an increasing fn. of $\underline{m}$.



b. Normalized or staggered operation

This is a mere matter of summation, but the Lutzes, Joan Robinson, Cassell, and many critics of Wicksell and Co. have thought there was something about normalization that changed basic implication of single cycle case, that longevity is the essence of capital-intensity.

Assume perfect normalization: plant and cut one tree yearly. Number of trees growing equals $\underline{m}$: there is one of every age.

Yearly output, $F = Pe^{im}$

Yearly wage bill = P

Labor share $= \frac{P}{Pe^{im}} = e^{-im}$, as before

Capital, $K = \int_0^m Pe^{in}\, dn = P \int e^{in}\, dn = P \frac{e^{im}-1}{i}$

(Various proofs available for integral, but note it is simply the standard formula for the amount of an annuity.)

Yearly interest = $Ki = P(e^{im} - 1)$

Capital share = $\frac{P(e^{im}-1)}{Pe^{im}} = 1 - e^{-im}$, as before.

3. Depreciating Capital

Another summation, because PIPO is the math. building block from which all annuity formulae derive by summation. But many require convincing.

a. Single Cycle

A house yields steady service flow of $1. over $\underline{m}$ years. It depreciates because of declining future life rather than decaying service flow.

Sum of service flows = $m over $\underline{m}$ years.

Warranted initial payroll outlay is present value of annuity of $1. over $\underline{m}$ years.

$$P = \frac{1 - e^{-im}}{i}$$

This is equilibrium outlay for constructing building to endure $\underline{m}$ years.

Assume perfect vertical integration, so there is no outlay but payroll. (In practice, most depreciating capital requires primary products or raw material, the latter resulting from PIPO-type cycles, and a full model will integrate the two.)

$$\text{Labor share} = \frac{P}{m} = \frac{1 - e^{-im}}{im}$$

a decreasing fn. of $\underline{m}$, due to more powerful influence of $\underline{m}$ in the denominator. To prove, show derivative of

$$\frac{1 - e^{-im}}{m} < 0.$$

$$\frac{d}{dm}\ \frac{1-e^{-im}}{m} = \frac{m\,i\,e^{-im} - (1 - e^{-im})}{m^2}$$

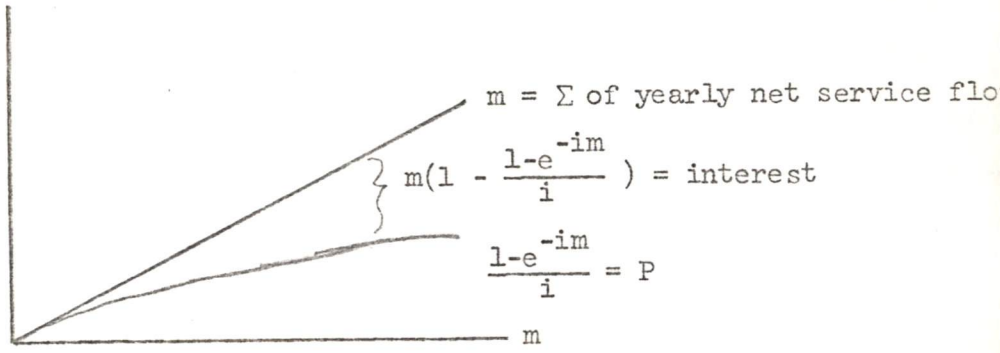
Derivative negative if

$$m\,i\,e^{-im} < 1 - e^{-im}$$

$$m < \frac{e^{im} - 1}{i} = \text{Amount of an annuity of one per annum,}$$

always greater than m, if $i > 0$.

So labor share is a decreasing fn. of m. Graphically,



Interest is residual, $m - \frac{1-e^{-im}}{i} = m - P$

Capital share $= \frac{m-P}{m} = 1 - \frac{1-e^{-im}}{im}$

This is the complement of labor's share, and is an increasing function of m. It so appears on the graph.

Note graphical demonstration that P/m is a decreasing fn. of m. As m doubles, P cannot double, because curve is concave downwards.

b. Normalized or staggered operation

Build and demolish one house yearly. Number of houses equals number of years of life (m). This entails double-summation of the PIPO building block, but may be simplified.

Yearly service flow = m ($1 @ from m houses)

Yearly $P = \frac{1 - e^{-im}}{i}$ (cost of one house)

Labor share = $\frac{1 - e^{-im}}{im}$ as before, a decreasing function of m.

Yearly interest bill as residual = $m = \frac{1 - e^{-im}}{i}$

Capital share is $1 - \frac{1 - e^{-im}}{im}$, as before, the complement of labor's share and an increasing function of m.

To confirm, calculate interest bill directly by finding amount of capital, K.

$K = \int_0^m V_n$ where V_n is remaining present value of the house whose remaining, unexhausted future life is n. (if n were elapsed life we would want $V_{(m-n)}$.)

$$V_n = \frac{1-e^{-in}}{i}$$

$$K = \int_0^m \left[\frac{1-e^{-in}}{i}\right] = \frac{1}{i}\left[m - \int_0^m e^{-in}\right] = \frac{1}{i}\left[m - \frac{1-e^{-im}}{i}\right]$$

(Note the integral performed is merely the standard case of the present value of an annuity.)

Interest, yearly amount, $= Ki = m - \frac{1-e^{-im}}{i}$

Share of capital $= \frac{Ki}{m} = 1 - \frac{1-e^{-im}}{im}$ as before, an increasing function of m.

4. The Brems-Wicksell macro model.

Note in every case examined, $K = +f(m, P)$

Let $P = M \cdot W$

M = Man-hours (including females)

W = Wage-rate per man-hour (no discrimination)

$M = f(K, \frac{1}{m}, \frac{1}{W})$

Implication: to increase employment, increase capital, reduce $\underline{m}$ (speed turnover), and/or lower wage-rate.

In specific cases, sensitivity of M to m is very high, suggesting attention to this factor.

a. PIPO example.

$$K = P\frac{e^{im} - 1}{i}$$

$$P = M \cdot W = \frac{K \cdot i}{e^{im}-1}$$

$$M = \frac{K.i}{W[e^{im}-1]}$$

b. In simple inventory model (p. 1), it is clearer, although over-simplified and omitting interest.

On p. 1, $F = KR$.

But $F \propto M$

and $R = \frac{1}{m}$

$\therefore \quad M \propto \frac{K}{m}$

5. Effect of taxes on land use

Method: define effect of taxes on present value of site. PIPO case.

Begin with pretax equilibrium where

$$S = \frac{F - Pe^{im}}{e^{im}-1}$$

S is independent of m for all $F = (P + S)e^{im} - S$ (an identity)

a. Income tax

$\pi \equiv$ Site value after income tax. Assume tax lodges 100% in lower Site value, i remaining fixed.

$$\pi = \frac{F(1 - t) + tP - Pe^{im}}{e^{im} - 1} = \frac{S(e^{im}-1)(1 - t) - tP(e^{im}-1)}{e^{im} - 1} = S - t(S + P)$$

The percentage decline of S is:

$$\frac{S - \pi}{S} = t\,\frac{S + P}{S} = t\,(1 + \frac{P}{S})$$

This is not a neutral tax. It favors low values of $\frac{P}{S}$, thus motivating less intensive use.

b. Property Tax on Capital

θ is site value after absorbing property tax on tree value. Tax on site value is not included, being assumed neutral.

Tax base is $F_n = (P + S)e^{in} - S$. This is an idealized base, the investment value. In practice, base is usually lower.

$$\theta = S - t \int_{h=1}^{m} \frac{F_n}{e^{in}} \, dn \, \frac{1}{1-e^{-im}}$$

$$= S = t \left[\int_{o}^{m} \frac{(P+S)e^{in}}{e^{in}} \, dn \, \frac{1}{1-e^{-im}} - \int_{o}^{m} \frac{S}{e^{in}} \, dn \, \frac{1}{1-e^{-im}} \right]$$

$$= S - t \left[(P+S) \frac{m}{1-e^{-im}} - \frac{S}{i} \right]$$

The percentage decline of S is:

$$\frac{S - \theta}{S} = t \left[(1 + \frac{P}{S}) \frac{m}{1-e^{-im}} - \frac{1}{i} \right]$$

This is not a neutral tax either, under present assumption of the tax's lodging in lower site value (it <u>is</u> neutral if tax lodges in lower rate of return).

Direction of non-neutrality is different from usual emphasis, however. Sensitivity analysis shows the following:

1. $\frac{S - \theta}{S} > t$

2. $\frac{S - \theta}{S}$ is highly sensitive to P. To avoid tax, one holds down P -- i.e. fails to reforest. This is the paramount effect, rather than the one usually stressed, i.e. the tendency to hasten cutting of mature wood.

3. $\frac{S - \theta}{S}$ varies inversely with S, i.e. tax is harder on marginal land.

4. $\frac{S - \theta}{S}$ varies with <u>m</u>, but weakly, and at the lower level of stocking caused by (2).

6. Effect of changes in wage and interest rates on durability.

Graphical demonstration.

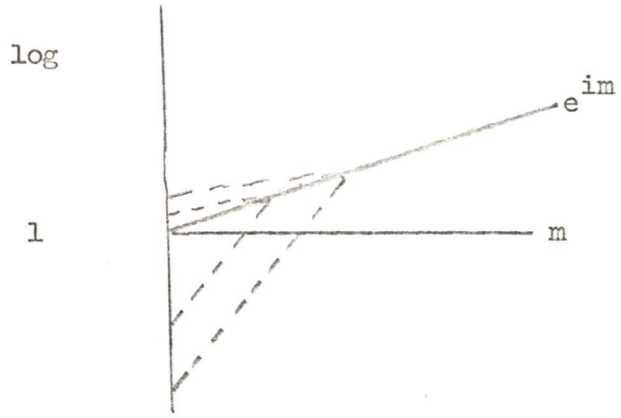


Figure 1

Let e^{im} be locus of future values having present value of unity at discount rate = i.

At a lower rate, h < i, present values from the locus curve are $\frac{e^{im}}{e^{hm}} = e^{(i-h)m}$, an increasing fn. of m (i - h > 0), shown by ascending y-intercepts above unity.

At a higher rate, j > i, present values from locus curve are $\frac{e^{im}}{e^{jm}} = e^{(i-j)m}$, a decreasing fn. of m (i-j < 0), shown by descending y-intercepts below unity.

So if capital is scarce, interest rates rise, causing shorter investments to look better. This speeds capital turnover, substituting labor for capital (cf 2, 3) and vice versa.

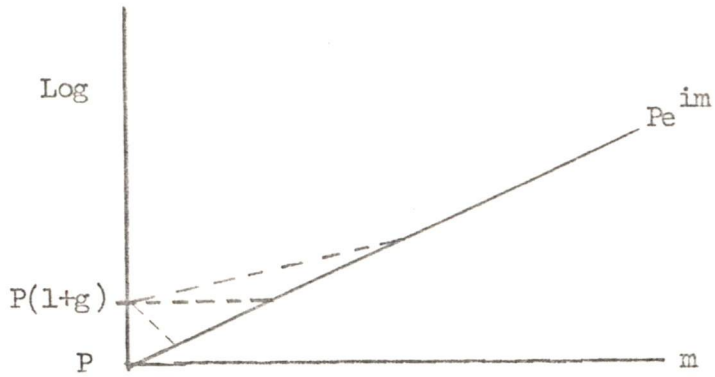


Figure 2

Figure 2 shows rise of wage rate with no change in value of product. Pe^{im} is locus of values yielding interest of $\underline{i}$ when payroll cost is P. Higher wage rates raise cost to P(1 + g). Dash lines show growth of investment at internal rate of return. Higher slopes mean higher rates.

Let $\underline{r}$ = internal rate

$$e^{rm} = \frac{Pe^{im}}{P(1+g)}$$

$$rm = im - \ell n\,(1 + g)$$

$$r = i - \frac{\ell n(1+g)}{m}\text{, an increasing fn. of } \underline{m}.$$

So higher wage rates cause longer lives to be preferred, thus substituting capital for labor (cf 2, 3). And of course vice versa.

Thus lower wage rates and higher interest rates lead to full employment, in a free market (if we had one).

But it is the wage and interest rates <u>as perceived and experienced by the entrepreneur</u> that are controlling. Here is where institutional bias intercedes. Labor costs employers much more than labor takes home in pay. But capital and land cost employers less, at least comparatively.

Francisco, Robert B. Shetterly, president of Clorox Co., Jerè Helfat, president of Koracorp Industries, Inc., and Marron Kendrick, president of Schlage Lock Co. Their audiences were attentive.

"The discussion of the Koracorp five-year plan was very well done," said Julien Thiriez, a vice-president of Dollfus Mieg et Cie., a clothing manufacturer. "We are doing the same kind of planning now, but we are not so advanced."

Jean Voil Bongrain, president of Ste. Bongrain Gerard, an $80-million-a-year cheese maker, was fascinated with the description of Hilgert's efforts at turning Blum's, the old-line candymaker, around. "There were several things that could be useful to us," Bongrain said. "I was particularly interested in the strategy for distribution, which goes beyond a marketing strategy."

After three full days of briefings and discussions in the San Francisco Bay area, including sessions at Stanford Research Institute and the Bank of America, the group moves to New York. Companies giving the French an East Coast view of business include Singer, Babcock & Wilcox, Rapid-American, and Carpenter Technology.■

ENVIRONMENT

The modest price of purging pollution

In public speeches and private lobbying, many businessmen have repeatedly urged the Nixon Administration to tally the costs of air and water pollution control. This week the government did, and its findings are encouraging evidence that the nation will not purge its affluence along with its effluents.

In a 42-page report, the Council on Environmental Quality, the Commerce Dept., and the Environmental Protection Agency concluded that the impact of cleanup costs "would not be severe," either on the 14 industries studied (table) or on the nation's economy.

The studies of the industries, prepared by 11 consultants, did turn up some adverse effects, but they are surprisingly limited:

- Manufacturers unable to pass control costs to their customers would suffer a profit squeeze. But the squeeze would mainly affect companies facing intense foreign competition and small plants unable to achieve economies of scale in pollution treatment.
- Of 12,000 plants in the 14 industries, 200 to 300 would probably be closed by 1976 because of pollution-control requirements. But most are already old and marginal, the report said, and probably would have been shut by 1980 anyway.
- From 50,000 to 125,000 jobs would be lost by 1976, or about 1% to 4% of the workforce in the 14 industries. But that is only 0.05% of total current employment, and new environment-related jobs would offset the impact, though not necessarily in the same communities.
- Prices would not rise at all in some

What it will cost polluting industries to clean up

Industry	Capital investment through 1976	Annualized cost, 1976*	Expected price increase, 1976	Impact
	Millions of dollars			
Baking	$11.8-21.3	$2	1-2¢ per lb. of bread	No substantial impact
Cement	122	43	4-5%	Large modern plants will replace smaller older ones; increase in imports
Electric power	17,800	2,500	2.8-10.7%	No decrease in demand; little impact on energy-intensive industries
Fruit and vegetable canning and freezing	120	21.3	1.4-2.3%	0.5-1% decrease in consumption; 400 small, old plants may close, most replaced by larger ones
Iron foundries	348	125	1.7-5% per ton of castings	No effect on consumption or imports; small foundries will continue to close
Leather tanning	89	10.7	1-2%	No substantial impact
Aluminum smelting and refining	935	290	5-8% per lb.	4-6% decline in sales expected by 1976; exports down, imports up; little impact on employment
Copper smelting and refining	300-690	95	0-8%, depending on foreign competition	Two smelters may close; slower growth in employment
Lead smelting and refining	70	20	5% per lb.	Efficient producers will continue to replace high-cost manufacturers
Zinc smelting and refining	62	27	Not available	Inefficient producers will be forced to shut; others face profit squeeze
Petroleum refining	634-1,155	129	1.4% per bbl.	No substantial impact
Pulp and paper	3,300	198	3.5-10%	Little effect on demand; some marginal plants will close
Steel	2,400-3,500	760-1,100	0.7-1.5%	Data inadequate
Automobile [auto emissions only]	—	—	$294-343 per car	3% decline in expected 1976 sales; trend toward smaller cars, more imports

*Depreciation, operation, maintenance, and interest

Data: Council on Environmental Quality, Commerce Dept., Environmental Protection Agency

Robert McAuley

industries. In others prices would rise as much as 10% by 1976, with most of the increases expected to come in 1974 and 1975.

To measure the impact on the economy as a whole, the government asked Chase Econometric Associates, Inc., to perform a separate computer analysis, with the premise that industry would invest $26.2-billion in abatement hardware through 1980. Programming this figure into its econometric model, Chase found that plant and equipment prices rose sharply, pushing consumer prices up an additional 0.2 percentage point a year through 1976. That, in turn, cut demand, thereby retarding real growth. But the shortfall in gross national product is a relatively small $6-billion a year through 1980, or a decline from 4.8% to 4.7% in the real annual growth rate.

The aggregate increase in unemployment is small, too, rising from a projected 1972-80 average of 4.6% to 4.7%. The impact on both GNP and unemployment can be countered by stimulative fiscal and monetary policies, the report says. But it also concedes that such policies could cause additional inflation and thereby could trigger a trade deficit.

Indeed, foreign trade may be the most serious problem. The Chase study says the U.S. trade balance will lose about $700-million a year through 1976, as higher domestic prices spur imports and retard exports. But the study does not assess how much foreign prices will also rise because of environmental regulation. And, as the report notes, the U. S. may well become a major exporter of pollution-control gear in the next few years.

Pollution's toll: Several factors could alter the findings. For instance, heavy demand for pollution-control devices might swell their prices faster than is assumed. Also, the estimated water pollution-control costs are based on secondary-treatment technology. But if Congress passes the pending water pollution bill, with its goal of "zero discharge" by 1985, costs will probably soar.

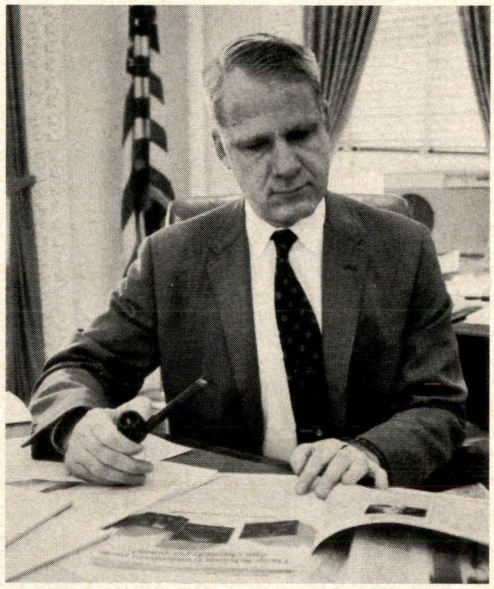
On the other hand, the studies assume that abatement yields no return. In fact, many companies are able to offset the costs by recycling waste, recovering valuable materials, and changing manufacturing processes. Moreover, as marginal plants are shut, the average productivity of a company or industry will increase, further counterbalancing costs.

The report reaches one other conclusion often overlooked: Society will reap substantial economic benefits from purging pollution. The damage to health and property from air pollution alone is a staggering $16-billion annually. ■

A plan to balance uranium demand

The Atomic Energy Commission is moving to head off, at least temporarily, a threat to one of U. S. industry's most lucrative exports—nuclear power equipment. Now worth $700-million a year, the business could grow to $3-billion a year by the 1980s.

The threat arose when the AEC's Congressional overseer, the Joint Committee on Atomic Energy, said it might have to bar the agency from accepting any more 30-year contracts from foreign utilities to furnish enriched uranium—the U-235 that makes up only 0.7% of natural uranium. The ability to offer assurances of such long-range supplies of U-235 is a big plus for U. S. equipment builders in the growing competition with foreign manufacturers. But the Joint Committee, disturbed by the growth in foreign orders that could swamp U. S. enrichment facilities by the late 1970s, made it clear that domestic orders would have to get priority.



Dennis Brack

AEC's Schlesinger boosts his agency's cash flow while paring a stockpile.

Buying time. Last week, the AEC came up with a plan which, it says, will buy time badly needed to get new enrichment plants planned and built. AEC will withdraw over several years some 50,000 tons of the 70,000 tons of raw uranium now in the national stockpile. It will enrich this in advance, a bit at a time, making use of the idle capacity currently available in its three enrichment plants.

This new stockpile of pre-enriched uranium will be used to fill orders in the late 1970s that exceed U. S. enrichment capacity, and thus should satisfy both domestic and export markets.

The Joint Committee is pleased. "I applaud the AEC's program to better utilize our enriching capacity," said Representative Chet Holifield (D-Calif.), who has been the committee's leading advocate of declaring a moratorium on enrichment for foreign customers. He now says that he will hold off for a while.

The Administration's Office of Management & Budget has given the AEC program a go-ahead. One big reason: The AEC has come up with a gimmick it says will more than cover the cost of its new investment in pre-separated U-235. The agency will cut the cost of the enrichment process, while continuing to charge customers the going price of $32 per kilogram.

To do this, the agency will take less U-235 out of each ton of uranium feed. The residue, or "tailings," will contain up to 0.3% of U-235 instead of the usual 0.2%. By not going after that "last drop," the agency will save a disproportionate amount in process operating expenses. As a result, says AEC Chairman James R. Schlesinger, "this is one of the few government activities that will have a sizable net cash flow"—an estimated $1.3-billion between now and 1980.

One additional benefit cited by Schlesinger: The plan provides an orderly way to work down the uranium stockpile, which cost the U. S. more than $700-million and currently serves little purpose.

New capacity. The AEC plan delays by about a year, but does not lessen, the need for more enrichment facilities. Nor does it say who will build them.

The Administration's budget planners want industry, not government, to pick up the tab for the next enrichment plant, which could cost up to $1.2-billion. But industry has so far shown little enthusiasm for the idea. If nothing happens soon, the AEC will get more pressure from Congress.

Inaction also is likely to spur European efforts to become independent of U. S. enrichment services, which now account for $65-million in export business and should grow to $350-million by 1980. Britain and France each have a small enrichment plant, but the French Atomic Energy Commission is urging construction of a plant large enough to support all of Western Europe's planned nuclear plants. Meanwhile, however, the Soviet Union is muddling the picture by offering enrichment services at prices widely believed to be lower than cost. ■

was disclosed, a group of Congressional critics calling themselves Members of Congress for Peace Through Law had proposed that the F-14 program be canceled altogether. Last week, Sen. William Proxmire backed that stand and proposed buying improved models of the F-4 Phantom fighter, which the F-14 is supposed to replace. Packard, however, is not likely to propose anything that drastic. "Cancellation is not under active consideration," said Pentagon spokesman Jerry W. Friedheim. But because of the soaring costs, Packard may well have to accept a stretch-out of the program or a reduction in the total number of planes produced. One Pentagon source said the F-14 program might have to be trimmed from 722 planes to 500 or fewer. That would bring the total cost back to the neighborhood of the original estimate, or $8.4 billion—which isn't exactly peanuts even at 1971 prices.

ENVIRONMENT:

Banning the Bottle

"In all my experience in government," said Oregon's attorney general, Lee Johnson, "I have never seen as much pressure exerted by so many vested interests against a single bill." Nevertheless, Johnson predicted, "the people will prevail." And sure enough, last week the state's legislature became the first in the nation to pass a law discouraging the sale of throwaway bottles and cans. The law, effective Oct. 1, 1972, imposes an outright ban on pull-tab beer and soft-drink cans, and requires a 5-cent deposit on most other cans and bottles—a premium designed to make returnable bottles economically imperative.

Oregon Gov. Tom McCall had been pushing the bill for more than a year, but he had to buck heavy opposition from both labor and industry. Can and bottle companies sent officials to Oregon to lobby against the bill, and two state senators testified that as many as 500 Oregonians might lose their jobs in the state's can factories. Yet McCall got support from at least one unexpected source—farmers who testified that their cows had died from eating hay that contained broken bottles thrown from passing cars.

JAPAN:

The New Gadflies

Japanese corporate directors, like their leagues elsewhere, have always tend- to view stockholders' meetings as ersome but legally necessary rituals are best concluded as quickly as le—an attitude supported by the l passivity of shareholders. The emish on the smooth proceedings n the irritating presence of *sokaiya,* professional hecklers mailers whose threats to dis- gs or to reveal embarrassing nation have forced manage-

ment to part with millions of dollars every year in payoffs.

But in the last few months a new kind of stockholder has emerged. Inspired by Ralph Nader's techniques, Japanese advocates of corporate responsibility have been buying up single shares in leading firms in order to attend shareholders' meetings to press their demands. In reaction, alarmed company officials have turned to their old tormentors, the sokaiya, for help in routing the new breed of corporate gadflies. In one twelve-minute meeting near Tokyo some 50 one-share holders protested a company's contribution to air pollution, only to be shouted down by paid sokaiya. And Osaka's Chisso Corp., whose plant on Minamata Bay in Kyushu was allegedly responsible for the fatal mercury poisoning of 46 people, used guards and sokaiya to rough up and silence 500 protesters dressed as Buddhist pilgrims.



Kyodo

Mitsubishi stockholders' meeting: Robert's rules of disorder

Agenda: The most dramatic confrontation so far occurred last month when the general stockholders' meeting of Mitsubishi Heavy Industries, Japan's third-largest company, turned into what looked like the main event at a Japanese wrestling match. The giant corporation was the target of *Beheiren,* a large, loosely organized antiwar group that sees Mitsubishi as a symbol of the revival of the Japanese armaments industry. The pacifists bought 2,000 shares in the company, which accounts for about one-third of the nation's weapons production, and on the morning of May 28 some 200 of them turned out to attend the shareholders' meeting—wearing skeleton masks and carrying placards calling for "death to the merchants of death." They were enthusiastically resisted by company guards and some 30 to 40 ultrarightists brandishing wooden rifles. And once inside the hall, the Beheiren protesters could only watch as the sokaiya "master of ceremonies," Eiji Shimazaki, manipulated the meeting like an orchestra conductor. He had the agenda approved, a question period vetoed, the dissenters beaten up or chased off the floor and the meeting adjourned—all in twenty minutes. After it was all over, MHI president Yoichiro Makita told the press that he had been willing to debate the demonstrators but that they had "behaved like madmen." "Next time they should not bring those death masks," he added. "They aren't good for an older man with a weak heart like me."

Some 250 officials from other companies showed up to watch the sport and pick up ideas on how to handle demonstrators of their own. And several leading companies are now publicly suggesting that only a holder with more than 1,000 shares should be allowed to attend company meetings. Such talk isn't likely to intimidate the new corporate gadflies; "We stay up all night racking our brains out on how to annoy Mitsubishi," Yuichi Yoshikawa, Beheiren's Secretary-General, says proudly. But the reformers face heavy odds, symbolized by the diminutive, furiously energetic Shimazaki. "No company can have a shareholders' meeting without me," he boasts. "I own stocks in every firm listed. I own 30,000 shares in Mitsubishi Heavy Industries. Beheiren owns only 2,000 shares. Why should they be as influential as people like me?"

AFRICA:

A New Riviera?

Among the emerging nations of black West Africa, the Ivory Coast stands as a prosperous monument to enlightened economic development. Under the one-man rule of President Félix Houphouët-Boigny, the former French colony seeded



Andrew Jaffe—Newsweek

Ivory Coast tourists: But how many more will come?

its boom with exports of coffee, cocoa and timber and then—unlike some of its fiercely nationalistic neighbors—nurtured it by openly courting foreign industry. Houphouët-Boigny offered the foreigner currency convertibility, easy repatriation of profits and immunity from nationalization. The result: economic growth of 11 per cent a year; per-capita income heading toward $300 a year for 5 million Ivorians, far above average for the region; a showcase skyscraper capital on the deep-water port of Abidjan, and modern transportation and communications networks throughout the interior. And Houphouët-Boigny keeps priming the pump. His current five-year development plan calls for another deep-water port, at a cost of $80 million, and a $200 million dam project—$80 million for the dam itself, plus $120 million to resettle the people who will be flooded out when it opens.

Bubble? But this development program now calls for a project that some critics say could burst the Ivory Coast bubble. In hopes of attracting a steady supply of free-spending tourists, Houphouët-Boigny, in partnership with Israeli promoter Moshe Mayer, wants to build what he grandly envisions as an "African Riviera" at Abidjan. The complex, which it is hoped would create 50,000 new jobs, would include hotels, beaches, sports and convention facilities and even an "African Disneyland," a combination game preserve and amusement park on a 100-acre island half a mile offshore. As the potential tourists, Houphouët-Boigny has his eye on the hundreds of thousands of Europeans and Americans who flock to East Africa each year. For example, Kenya, with its wild-game preserves, pulls 300,000 foreigners annually, who leave behind some $100 million in foreign exchange.

But while Houphouët-Boigny dreams great dreams, few dream along with him. When—or if—it is completed years from now, the project will have cost a total estimated at $2 billion. The French, who have invested more than $100 million in the Ivory Coast in the last ten years, have yet to promise a penny for the new Riviera. Since last September, the World Bank has been warning Houphouët-Boigny that the cost of the resort complex could endanger his country's credit rating. The bank's analysts fear that the five-year plan, which includes the first phase of the Riviera—a golf course, two hotels, a housing development—may cost $1.1 billion rather than the budgeted $800 million. This, they say, would be too much for a country with only $278 million in foreign exchange and heavy debts. Moreover, rank outsiders are not alone in questioning the feasibility of Houphouët-Boigny's plan. "Who knows what this will cost?" asks a French economist on loan to the Ivory Coast.

Ultimately, the question is whether the Ivory Coast could ever be a Mecca for tourists. Houphouët-Boigny leans unquestioningly on a survey commissioned by his own developer that predicts 172,000 tourists by 1975 and 300,000 by 1978. But the fact is that only 22,000 foreigners visited the Ivory Coast in 1968, the last year for which statistics are available. Houphouët-Boigny points with pride to Abidjan's Hôtel Ivoire and its 90 per cent occupancy rate, but six new hotels in the interior are empty most of the time. He expects a huge influx of Americans to his steaming country, but in 1968 fewer than 1,000 came from the U.S.

Vacation: Indeed, the prospects for attracting Americans are so shaky at this point that Houphouët-Boigny may already be looking elsewhere. Some U.S. analysts suspect that his recent call for Black Africa's rapprochement with white-supremacist South Africa may be based partly on the hope of luring some of that country's 3.6 million whites to vacation at his Riviera.

Even if that gambit fails, the feisty Houphouët-Boigny seems determined to go ahead with his dream. At the insistence of his economic advisers, he has reluctantly agreed to review his plans for the massive project. But, as one government official commented ruefully last week: "The feeling around here is that anyone who speaks up against the Riviera can expect to be out of a job."

MANAGEMENT:

One Touch of Larceny

Since the dawn of the Industrial Revolution, bosses of every stripe have been puzzling over how to keep workers in humdrum jobs happy and productive. Now comes Lawrence R. Zeitlin, a 40-year-old industrial psychologist at the City University of New York, with what may well be the first new answer to the old problem in a generation. Zeitlin's notion, spelled out in the June issue of Psychology Today, is summed up in his title: "A Little Larceny Can Do a Lot for Employee Morale."

Zeitlin makes a perfunctory bow in the direction of "ethical considerations," but his theme is grounded in a no-nonsense—not to say cynical—view of the human condition. "Well over 75 per cent of all employees," the author flatly declares, "participate to some extent in merchandise shrinkage." This, he hastens to add, includes people who take home paper clips or office stationery. But counting everything, Zeitlin says, theft in cash and merchandise from retail establishments amounts to about $4 billion a year. And, he adds, "the stores' own employees steal three times as much as do shoplifters."

A Job: What's to be done? For his answer, Zeitlin draws on a two-year study he made for a "large Midwestern clothing store" that was having theft problems. More than half of the employees discharged for stealing, he discovered, had been doing so mainly for the satisfaction of "getting away with it"—or what Zeitlin calls "job enrichment." Actually, says Zeitlin, the pilferage was costing the store only $1.50 per worker per day, and that was a bargain. "By permitting a controlled amount of theft," Zeitlin generalizes, "management can avoid reorganizing jobs and raising wages." He also notes that the employee who steals takes pains to appear conscientious, thus cutting down on tardiness and other forms of job indifference. "It is common knowledge in financial circles that the man with his hand in the till is never absent," Zeitlin observes. His pragmatic conclusion: "Controlled employee theft can be used as a positive implement in management's motivation toolbox."

As one example of how this works, Zeitlin cites the case of "a large Midwestern city" that has drastically reduced

Stripping uses cap. & land instead of labor. It is the reverse of needed policies.

So now I can attack non-regen. of forest land, plus strip-mining, as results of bad tax policy.



Guy Mendes

Peabody Coal's monster stripper at work: For 26 states, the threat of moonscapes

Peeling Back the Land for Coal

From 500 feet in the air, the patch of Belmont County in eastern Ohio looks like the light side of the moon: as far as the eye can see stretch ribbons of tan, boulder-pocked rubble, treeless and bleak. The moonscape's only color is offered by dead water trapped in gullies, blue-green with algae in some spots, blood-red with killing acids in others. And at ground level the sight can be just as chilling. Driving across the Western Kentucky Parkway in the dead of night, through coal-rich Muhlenberg or Hopkins counties, a motorist feels like a science-fiction tourist. Giant power shovels loom like eerie monsters, the floodlights on their superstructures giving them a War of the Worlds quality, their huge buckets screaming like bull elephants as they tear into the earth.

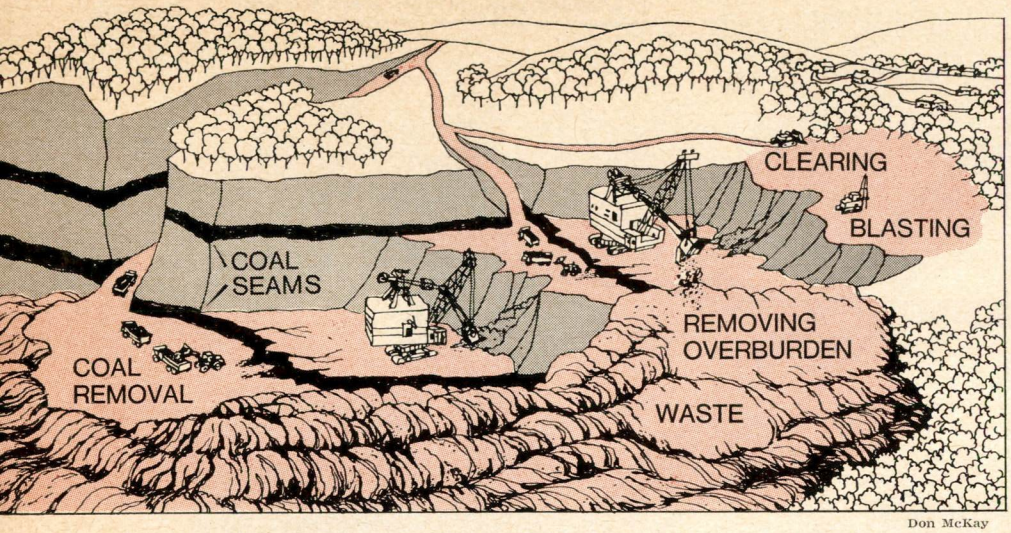
But this is no fantasy. It is the sight and sound of strip miners, slowly but surely chewing their way across tens of thousands of acres of land in 26 states ranging from Pennsylvania in the East to Washington in the West. The prize is an estimated 130 billion tons of coal.

After two decades of dwindling status, King Coal is coming back. With energy demands slated to triple in the next 30 years, oil and gas reserves are being exploited faster than new ones are being discovered, and nuclear development is behind schedule. But known coal reserves are fully adequate to meet the nation's energy needs. "A new day is dawning for coal," Carl Bagge, president of the National Coal Association, told his members last week at a Washington convention. "The '70s will be the decade in which coal achieves its natural birthright as the principal energy source for the nation."

If Bagge is right—nobody seriously disputes the thesis—increasingly large portions of this coal will be mined by stripping rather than conventional deep-shaft methods. Stripping dates back all the way to 1832, when miners on Mauch Chunk Mountain in eastern Pennsylvania first used dynamite, picks and shovels to uncover a seam of anthracite. But in recent years the development of huge new machines has brought such staggering new capacity that stripping has almost become a new phenomenon—one that is seriously alarming ecologists, citizens who live near the stripping grounds and state and national lawmakers.

In the Appalachians, mountainsides are being bulldozed into the valleys to expose underlying layers of coal or prepare the way for giant augers—drills up to 5 feet in diameter—to chew into coal seams. On the rolling, wooded lands of southern Ohio, Illinois and Indiana, the bulldozers merely slice the vegetation off to prepare the way for monstrous shovels that can literally peel off a layer of dirt and rock 150 feet thick to get at a stratum of coal. Both the machines and the process nearly defy description. There is, for instance, the Hanna Coal Co.'s Gem of Egypt, a shovel with a 200-ton bite, a boom ten stories high and a body so big it contains a shower room for the crew. Powered by a 7,200-volt power plant, the Gem consumes more electricity each day than all of St. Clairsville, a town of 4,604 near the shovel's work site in Belmont County, Ohio.

Thanks to the Gem and others like it, stripping this year will amount to nearly 40 per cent of total U.S. coal production, as compared to 34 per cent as recently as 1968 and a minuscule 1 per cent 54 years ago. The industry argues that even more stripping is economically inevitable; with the giant machines, a dozen men can mine as much coal as 100 underground miners. Adding to the argument, the Coal Mine Health and Safety Act of 1969 raised underground costs still higher. In fact, a good many smaller operators have closed down entirely, leaving the field to the big companies—and, increasingly, to major steel and oil companies that have bought out the old



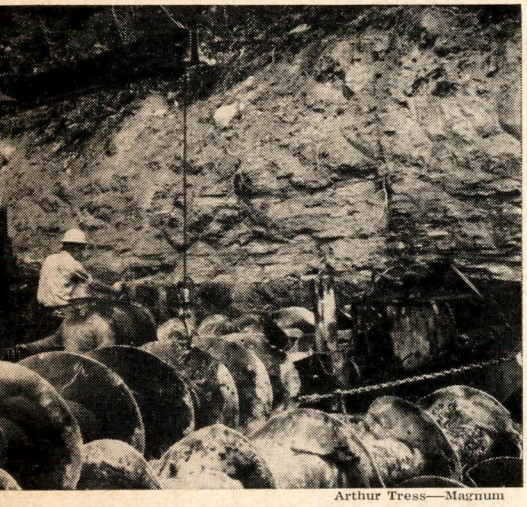
Don McKay

The stripper's technique: Peeling off the geography



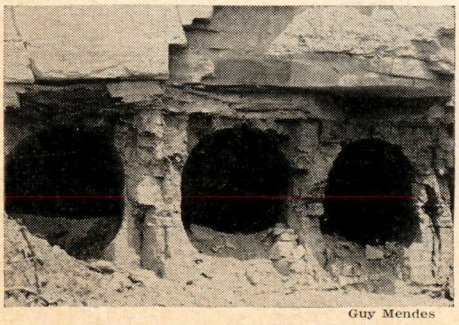
Phil Primack—Mountain Eagle

Protesters: Not everyone caves in



Arthur Tress—Magnum

Kentucky: Giant augers readied . . .



Guy Mendes

. . . to bite into coal-filled hillsides

coal kings. The oil industry now owns 30 of the 50 biggest coal producers, and controls 35 per cent of coal production; Humble Oil Co. alone owns 6 billion tons of coal reserves.

The tragedy is that the apparent economy and efficiency of stripping are grossly misleading, since the cost on the companies' books doesn't include the lasting damage that stripping inflicts on the countryside. Already, some 3,000 square miles of America have been ravaged by strip mining; according to the U.S. Geological Survey, only about a third of this land has been given any reclamation work at all. Moreover, at least 10,000 miles of waterway have been fouled by acids and life-sapping siltation caused by the changes in earth strata and contour. Sums up Dr. Gordon MacDonald of the President's Council on Environmental Quality: "An area almost the size of Connecticut has been scarred. By 1980, at present rates, another Connecticut will be added." Even that would be comparatively small; in the long run, the Geological Survey estimates that there are 71,000 square miles of America that can be profitably strip mined—an area nearly the size of Connecticut, Maryland, New Jersey and New York combined.

Wasteland: While stripping pocks the land from Scranton, Pa., to the West Coast, much of it is concentrated in West Virginia, Ohio, Kentucky, Illinois and Indiana. Perhaps nowhere can one better grasp the all-pervasive effect of strip mining than in Ohio's Belmont County, where 200,000 of the county's 341,000 acres have been leased, sold or optioned to strip-mine operators. Some 40,000 acres have already been stripped.

The Egypt Valley, once a fertile, 30-mile stretch dotted with 50 farms and the crossroads village of Egypt, now is a wasteland—the playground of the ironically named Gem of Egypt and her smaller siblings, the Silver Spade and the Mountaineer. The little village of Hendrysburg, a cluster of soot-covered homes near the I-70 interstate superhighway, shakes periodically with dynamite blasts just over the hill. Foundations have been cracked, residents have been knocked off their feet and the town's water supply has been affected by cracks in the aquifer, the subterranean layer that traps water for wells. A few of the town's residents have tried to fight the strippers in court, but the complexity of the law and the power of the coal companies have worn them down. When NEWSWEEK's Tom Joyce and James Bishop Jr. visited Hendrysburg two weeks ago, they were met by citizens on their front porches with hollow expressions of defeat. "There just ain't nothin' we can do," said one gnarled old-timer. "They have the power and the money. We don't have nothin'."

The coal companies argue, with considerable justice, that their operations are necessary to fuel the nation and benefit at least some people even in the ravaged areas. Strip mining brings jobs to at least a few truck drivers and bulldozer operators, and royalties to local landowners that range from 10 or 15 cents a ton to as much as 45 cents a ton. In Pikeville, Ky., bankers say that more than 50 of the town's 4,400 residents have been made millionaires by coal.

But the cost remains to be counted. "Strip mining," says West Virginia Congressman Ken Hechler, leader of a Congressional fight to ban it altogether, "is like taking seven or eight stiff drinks. You are riding high as long as the coal lasts, but the hangover comes when the coal is gone, the land is gone, the jobs are gone and the bitter truth of the morning after leaves a barren landscape and a mouth full of ashes." And more and more coal-field communities and coal-state legislatures—as well as their representatives in Washington—are coming to that same realization, and pressing for stiff new laws that would force the strippers to repair at least some of the ecological damage they do.

Laws: Repair is the best that can be hoped for; it is flatly impossible to restore the stripped land to anything like its former condition. But local laws governing reclamation range from barely adequate to nonexistent. In Pennsylvania, for example, anthracite miners need only bulldoze their spoil banks into a semblance of the original contour of the land; no seeding, mulching or fertilizing is required. Of 26 states with extensive stripping operations, only nineteen have any reclamation laws at all. And of the existing laws, Interior Secretary Rogers C.B. Morton says bleakly: "I just don't know whether they are being enforced."

Indeed, reclamation is very largely a voluntary affair. And even as they fight tougher legislation in Congress and the state legislatures, the mine operators promise in speeches, advertisements and interviews that they intend to do their part. "It is hard to defend what happened in the past," concedes Carl Bagge, "but the future will be different. The operators are not the same as the people who stripped Kentucky in the 1930s."

(Continued on Page 72)

When we decide we need use less extractive ress., we react rationally -- use less, get more from what we do use, find substs.

But re land surface, react perversely. Force people to use more.

Timber cycles, easy to explain normalized opn. using more labor. (release capl. to use bldg. sewer plants)

Bldg. cycles, also easy. But how show this is good consn?

Idea is to sub. labor for nat. ress. How does freq. renewal do that?

1. Begin w. fewer mtrls.
   a. Res. of lower cost
   b. ~~Also~~ The more durable the product, the ~~more~~ higher the mtrl. cost ÷ labor cost.

Durable things use granite, marble, heavy metal frames, solid oak doors, massive valuable mtrls. Since earth is durable, the most durable products are those most resembling earth.

2. Get more service flow from infrastructure of city. Recycle sites.

Thus reduce need to extend roads, utilities; & to drive cars.

3. Renewal does not mean tear down for empty use. Emphasis is not on demolition, but rebuilding.

Now, slowness is not always in destroying the old, but putting up new.

3 Timber grows capl. — no Δ resids. from shorter life. Res. get less yearly growth per acre. Probly more per unit of capl? Certainly get less per unit of labor, cap. after Δ C_o. Probly less

Bldgs. Less added service from same materials per unit of C_o by longer life.

Many waste expln. joints in condemning

Building requires heavier materials.

Obsolescence, 'planned' — depends on who plans it. Cities must lessen simply imposing their tastes. We already have forced longevity, in planned

4 obsolescence.

Recycling old carcasses, not incomint. w. faster payback.

Fast payback is the point, not scrapping carcass. Scrapping - salvaging is to recycle materials on-site, save land.

Beware resids. Chauvinism. Full empl. a bigger goal.

+ Where longevity is cheap, prices fall to reflect it, demand rises, so the longevity is exploited.

discretionary

The optimum longevity we are discussing is what comes at a cost.

? The cost includes extra land-time, which forces recourse to other land, etc.

Much frozen cap. is invisible, intangible — not what you think.

R&D; educ; entity, expln. Involves no materials flows anyway.

Appropn; Soddenstein's space shuttle.

3 If it did Δ resids, not very serious. Other policies I recommend will make fewer metals be extracted. So all metal goods will be more labor-intensive anyway.

in fact these same policies, bec. extractives are more cap.-using.

And also have less land in forests, bec. forestry is cap.-intensive, so removing biases will contain forestry as well as modify it.

2. Fast turnover Δs resids. flow through only by Δ empl., which is the object.

But blame it on Δ empl., not on turnover as such. If Δ empl. w. const. T, must have larger stock of capt. (then also get more output, & higher cap. share,) & less resid. per unit of output, but not less per man employed. (Probly more per man)

To Δ empl. w/o Δ resids., must sub. labor for metals. in produn.

18 April 1972

TO: Joseph L. Fisher

FROM: Mason Gaffney

RE: "RFF's Future Program," draft dated April, 1972. These reactions are partly fortifying, partly modifying, partly probing.

1. RFF has overstated the 'abundance'theme, failed to tackle certain problems:

   a. Increased dependence on foreign sources. This is mentioned, p. 3 and stressed, pp. 10, 24, 31, but not the military or mercantilistic aspects specifically, or the multi-nationals. Is it premature to lay out problem areas here? E.g. to what extent is the military deployed to protect U.S. raw materials? Is a benefit-cost analysis of world policing possible? How achieve maximum security and minimize cost?

      It strikes me that the environmental handle on this set of problems is pretty forced, pp. 24-25. They are problems in their own right, and are indeed the central problems that exercised the Paley Commission and were given RFF as its mission in 1952-53. That is, resource scarcity in the U.S. means growing import-dependence. Does this jeopardize national security? Should we subsidize offshore investments? Should we support foreign client governments? Is defense a "public good"? Does resource security require U.S. direct ownership? U.S. military control?

   b. Increased environmental costs. We have an environmental emphasis, but no part of it emphasizes the environmental cost of overcoming materials scarcity, e.g. strip mining, oil spills, mining in wilderness areas, etc.

2. "Environmental quality" is wrongly epitomized as "overall problem of managing residuals," p. 2.

   The more encompassing problem is one of managing commons, i.e. resources without tenure. (The draft report elsewhere does seem to lean this way, e.g., p. 10). Dumping residuals in them is one major diseconomy resulting from non-tenure. But there are also others: street congestion; park congestion; rule-of-capture overuse of fish and oil and other fugitive resources; crowding of lakes; overuse of open range, etc.,etc. There are externalities that do not involve commons either -- e.g. neighborhood effects that zoning seeks to control. These may be 'residuals,' but not in the materials balance sense.

What is involved is most generally how to set price equal to marginal social cost, re residuals, commons, and all externalities. This is the transcendent epitome.

This approach ties in our work more easily with the thinking of many economists who are studying the institution of property. It is also central to the neglected study of damage functions, which are functions of congestion or density.

The above is alluded to, p. 3, top para., but actually I think our work here is neglecting it.

3. p. 4, reporting on issues of policy.

The researcher needs to know how close he can get to specific policy positions, especially in controversial areas, without crossing the line of political activity, etc. Can guidelines or examples be offered? When does a 'finding' become 'advocacy'? Maybe there's no problem, in which case no answer is needed.

4. The need for more flexible organization.

Amen and Right On! I believe the marginal dollar going into rather detailed work in some programs might be more productive if reallocated to clearing ground in some less intensively cultivated fields like international trade and investment in materials. And personnel might be more creative if encouraged, at least part time, to venture into new resource-related topics on their own initiative. These explorations might lead to decisions not to pursue, but too rigid a program division hierarchy might ossify, and the exploration never be made, the creativity never be unleashed.

5. These sallies would be most useful to me and my understanding of RFF if you could find time to respond, however briefly.

UMEDC 71-3



Technology and the Environment

Vernon W. Ruttan

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UNIVERSITY OF MINNESOTA

AUG 17 1972

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PRESIDENTIAL ADDRESS

Technology and the Environment*

VERNON W. RUTTAN

A BELIEF that the application of science to the solution of practical problems represented a sure foundation for human progress has been a persistent theme in American intellectual and economic history [26, 64]. During the two decades following World War II this belief was seemingly confirmed by the dramatic association between the progress of science and technology and rapid economic growth. The technological revolution in American agriculture, the growth of industrial productivity, the contributions of science to military and space technology, and the virtual elimination of the business cycle seemed to reinforce this perspective.

By the late 1960's, however, the formula that had permitted the United States to move into a position of scientific, economic, and political leadership in the world community was faced with both an intellectual and a "populist" challenge.[1] A view has emerged that the potential consequences of the power created by modern science and technology—reflected in the cataclysm of war, degradation of the environment, and psychological cost of rapid social change—are obviously dangerous to the modern world and to the future of man. The result has been to seriously question the significance for human welfare of scientific progress, technical change, and economic growth.

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[1] The populist literature is typified by Reich [66] and Ehrlich [28]. For a more serious treatment of the same issues see Commoner [23], Ehrlich [29], Mumford [56], and Caldwell [17]. Among economists Boulding [10, 11] and Mishan [51, 52, 53] have been particularly outspoken.

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Three Generalizations

In my judgment the response by economists to the challenges posed by these concerns has been overly defensive. Nevertheless, it seems useful to reemphasize certain considerations that have frequently been ignored in the heat of the challenge to economic thought and economic policy. Let me summarize my own perspectives in the form of three generalizations.

First, man has throughout history been continuously challenged by the twin problems of (a) how to provide himself with adequate sustenance and (b) how to manage the production and disposal of what in recent literature has been referred to as "residuals," in less elegant language as garbage [43]. Failure to make balanced progress along both fronts has at times imposed serious constraints on society's growth and development.[2] The current environmental crisis represents, in my view, one of those reoccurring times in history when technical and institutional change in the treatment of residuals has lagged relative to progress in the provision of sustenance, conceived in the broad sense of the material components of consumption.

Second, in relatively high-income economies the income elasticity of demand for commodities and services related to sustenance is low and declines as income continues to rise, while the income elasticity of demand for more effective disposal of residuals and for environmental amenities is high and continues to rise.[3] This is in sharp contrast to the situation in poor countries where the income elasticity of demand is high for

[2] "The ancient urban centers also confronted a problem that continues today: the disposal of garbage and rubbish . . . life must have been unsanitary, unsightly and odoriferous, at least to the great masses of the poor. The evidence suggests the prevalence of high mortality rates. Many ancient cities appear to have been literally buried in their own rubbish" [16, p. 117]. See also Rosen [68] and Caldwell [17]. Anyone who has traveled extensively in poor countries will recognize that Brown's description remains valid for even small communities living near the subsistence level. In poor communities use of energy to dispose of residuals is directly competitive with use of energy to provide for sustenance.

[3] Quantitative evidence with respect to the demand for environmental services is inadequate at this time.

sustenance and low for environmental amenities. The sense of environmental crisis in the relatively affluent countries at this time stems primarily from the dramatic growth in demand for environmental amenities.

Third, the capacity of a society to solve either the problem of sustenance or the problems posed by the production of residuals is inversely related to population density and the rate of population growth and is positively related to its capacity for innovation in science and technology and in social institutions. I take it as axiomatic that population growth is competitive with improvements in the quality of life in poor countries and that achievement of a population growth rate well below 1.0 percent per year within the next generation would represent a highly desirable policy objective for all nations. At the same time it is clear that in the high-income countries of the West and in Japan neither current nor projected population growth represents, in the foreseeable future, a serious constraint on the capacity to provide desirable increments in both sustenance and environmental amenities [48]. *The advance of science and technology has enabled modern society to achieve a more productive and better balanced relationship to the natural world than in the ancient civilizations or in the earlier stages of Western industrial civilization.* And continued technical advance is essential for further advances in both the material and aesthetic dimensions of culture. The fundamental significance of technical change is that it permits the substitution of knowledge for resources or of less expensive and more abundant resources for more expensive resources, or it releases the constraints on growth imposed by inelastic resource supplies. In this perspective the rhetoric about "finite earth" is clearly misleading. The impact of science and technology has been to expand the size of "spaceship earth" along those dimensions that are most significant for human existence.

Resource Requirements for Growth

Let me now return to the resource requirements for growth. We are now in the second major wave of concern with natural resource policy since World War II, the fourth since Malthus [8]. The first postwar wave of concern, in the late 1940's and early 1950's, focused primarily on the quantitative relations between resource availability and growth—the adequacy of land, water, energy, minerals, and other natural resources to sustain growth. The reports of the President's Materials Policy Commission [62] and the President's Water Resources Policy Commission [63] were the landmarks among the postwar resource assessment studies generated by this wave of concern.

A basic issue in these studies was an operational definition of scarcity. Physical indicators were clearly inadequate and misleading. The scarcity implications of indicators such as estimated reserves of energy and mineral resources and the productive potential of agricultural land failed to materialize. Indeed, surpluses of resource products have frequently been apparent even as scarcity predictions were announced.

In 1952 the President's Materials Policy Commission concluded that "in the U.S. the supplies of the evident, the cheap, the accessible are running out" [62]. However, during the last decades we have enhanced our ability to upgrade old resources, to discover new ones, to utilize them more efficiently, and to adjust to changes in relative resource availabilities. There has been a decline in the resource component of national output and both an absolute and relative decline in employment in the resource sectors [4]. If the Materials Policy Commission were writing today it would have to conclude that there have been abundant examples "of the nonevident becoming evident; the expensive, cheap; and the inaccessible, accessible."

Clearly an operational definition of resource scarcity requires an indicator that reflects economic as well as technical considerations. After a decade of methodological discussion and technical debate it has generally been accepted by economists and by knowledgeable scientists and resource program administrators that our price system provides the most effective indicator available of both absolute and relative resource scarcity [4]. A secular increase in the price of the product of a resource industry (crude oil or wheat, for example) relative to the general price level can be regarded as a reasonably accurate indicator of resource scarcity. Similarly, a secular decline in the real price of the products of a resource sector can be regarded as an indicator of a reduction in scarcity. In fact, the relative prices of most broad classes of resource products (forestry, minerals, agriculture) have been declining. Some resource products, the nonfuel minerals for example, are intermittently plagued with specific shortages (copper, sulfur, tin, etc.); but a stretch of high prices has not yet failed to induce successful efforts to locate new deposits, exploit old ones, and promote substitution of more abundant for relatively scarce resources [47, 61].

There has been some questioning during the last several years of whether these propositions remain as firmly grounded in empirical fact as they appeared to be in the early 1960's [57].[4] For example, there has been rising concern about energy shortages and the drain that economic growth in developed countries places on world resources [83]. The current energy "crisis" appears to reflect institutional contraints on allocative mechanisms and the increasingly effective efforts of raw material producing countries to broaden their shares of the economic rent from exploitation, rather than technological or resource contraints [76, 84]. And the stress that economic growth in the United States and other rich countries is placing on world resources appears to reflect excessive investment in military and space technology and effort, which is not only excessive when evaluated in terms of net social return on a global basis but is relatively intensive in its demands on energy and materials resources.[5]

Demand for Environmental Services

In this second postwar wave of concern with natural resource policy our traditional concern with the adequacy of the natural resource base to sustain growth has been supplemented by intense concern with the stress on environment associated with economic growth. We are now experiencing the effects of a rapidly rising demand for environmental services pressing against a relatively inelastic supply. The rising demand is derived from two sources: (1) a rising demand for the environmental assimilation of residuals, derived from growth in commodity production and consumption plus the energy production and transportation services associated with commodity production and consumption [43, 71]; and (2) a rapid growth in consumer demand for environmental amenities—for direct consumption of environmental services—arising out of rapid growth in per capita income and a high income elasticity of demand for such environmental services as freedom from pollution and congestion.[6] Rising competition between the demand for environmental services for disposal of residuals and the demand for resource amenities is producing a dramatic rise in the economic value of common property resources formerly regarded as free goods [31, 43].

As economists have worked with other environmental scientists on issues related to demand and supply of environmental services, the problem of operational definitions of demand, supply, and scarcity has again risen as a central concern in resource economics. It is again apparent, as when the concern was primarily with the quantitative or materials (or resource input) dimensions of resource policy, that physical criteria (algae bloom, sulphur dioxide and carbon dioxide concentration in the air, biochemical oxygen demand (BOD) levels and concentrations of nondegradable pollutants in streams or lakes, destruction of rare natural environments) are by themselves no better guides to the solution of resource and environmental policy issues than in the past. It is clear that any analytical system that will improve our capacity to arrive at an operational definition of scarcity must be capable of integrating physical and biological information with economic, social, and behavioral knowledge on both the demand and the supply side.[7] This is an essential step in the establishment of priorities for investment and management.

In addition to conceptual difficulties there is a basic lack of data about the ecosystem. My own reading of the literature leads me to the conclusion that no one knows with any useful degree of precision the extent to which the basic metabolic processes of the biosphere are being disturbed by activities leading to environmental modification. And there is even less information as to whether

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[4] Robert Manthy of the Department of Forestry of Michigan State University is engaged in a major study designed to update the Potter-Christy and Barnett-Morse time series data on resource consumption and prices.

[5] The assertion rests on inadequate documentation.

[6] I find Rothenberg's classification very helpful: "(1) Pure congestion is the case where all users generate identical rates of quality interference per unit of activity and share equally in the resulting quality impairment; (2) pure pollution is the case where some users generate very high rates of unit interference while others generate zero rates and only the latter experience quality impairment; (3) the general case is where all users both generate impairment and share it. . . . The variety of both abuse and victimization prevents an easy or complete categorization of users into guilty and innocent" [71, p. 115].

[7] "There has developed in the contemporary natural sciences a recognition that there is a subset of problems, such as population, atomic war, and environmental corruption, for which there are no technical solutions. There is also an increasing recognition among contemporary social scientists that there is a subset of problems, such as population, atomic war, environmental corruption and the recovery of a livable urban environment, for which there are no current political solutions. . . . The common area shared by these two subsets contains most of the critical problems that threaten the very existence of contemporary man" [23]. The article by Crowe was written in response to an earlier article by Hardin [31].

the effects of the occurring environmental modifications are, on balance, favorable or unfavorable to the future of the human environment—to the future of man.[8] There can be no question, however, that the problems of environmental congestion and pollution have achieved serious dimensions in specific localities and regions and that the casual use and diffusion of certain materials, such as chlorinated hydrocarbons, represents a serious threat to environmental stability, public health, and economic activity.

With the exception of work on the economics of recreation services and cultural amenities, economists have not seriously tackled the problem of providing quantitative measures of the demand for resource amenities.[9] Nor do we have a generally accepted theory of aesthetics that can serve as an effective guide to nonmarket choices in the ordering of priorities for investments designed to provide the resource amenities for which the market fails to make adequate provision [46]. We have as yet no clearly acceptable guides to priorities in public policy with respect to environmental quality.

Induced Technical Change

Recent debate with respect to environmental policy has tended to polarize around two alternatives. One is the anti-growth movement. Boulding [10, 11] and others have suggested a model, based on analogy with the bioecological model of a stable equilibrating system, which suggests the necessity of redirecting economic activity to limit the environmental stress resulting from human intrusions on the natural environment. My own inclination is to emphasize a second alternative, the redirection of technical effort to permit continued acceleration of the performance of the ecosystem.

Technical effort can be redirected toward reducing environmental stress. This alternative has been disregarded in much of the literature of the "environmental crisis." In past this stems from the positive, almost metaphysical, value placed on "equilibrium" in the bioecological model. In my judgment it stems to an even greater degree from a view that progress in science and technology is essentially autonomous-unresponsive to social and economic forces.[10] By and large, this view has remained unchallenged by the historians and philosophers of science and by most social scientists. In economics, for example, technological change has typically been treated as exogenous to the development process.[11]

Recent theoretical and empirical investigations, however, are resulting in a new perspective which views technical change as a dynamic response to resource endowments and to the social and economic environment. Hicks suggested, as early as 1932, that the direction of technical change could be influenced by changes or differences in the relative prices of factors of production [40]. This view was challenged by Salter [73, pp. 43–44]. The dominant view in economics has been that firms are motivated to save total cost for a given output; at competitive equilibrium each factor is being paid its marginal value product; therefore all factors are equally expensive to firms; hence there is no incentive for competitive firms to search for techniques to save a particular factor.[12] The major weakness of this argument was the failure to recognize that the process of technical change is itself a resource-using activity. It is now clear that much of scientific research, and a large part of education and training, can for purposes of economic analysis be regarded as resource-using activities producing new forms of physical and human capital that are more efficient than older forms [75, p. 20].

As prices change, firms are not limited to simply reallocating resources among known technical alternatives—along the neoclassical production function. They can instead allocate resources to

[8] For a definitive statement of the current state of knowledge with respect to environmental problems of worldwide significance see SCEP [80, 81]. For a useful review of the current state of knowledge with respect to agricultural and agriculturally related sources of pollution see the papers presented at the symposium on *Agriculture and the Quality of Our Environment* [13], the symposium on *Pollutant Impact on Horticulture and Man* [2], and the symposium on *Economic Research on Pesticides for Policy Decisionmaking* [82]. For a more popular, and sometimes populist treatment see Harte and Socolow [32].

[9] The burgeoning literature in the field of recreation economics derives largely from Clawson's formulation [18, 19]. The work of Baumol [6, 7] has occupied a similar role in the economics of cultural amenities.

[10] "Notwithstanding occasional declarations about its unlimited potentialities for social betterment, since is not guided by any social purpose. As with technology, the effects on humanity are simply the by-products of its own self-seeking. As a collective enterprise science has no more social conscience than the problem-solving computers it employs. Indeed, like some ponderous multipurpose robot that is powered by its own insatiable curiousity, science lurches onward. . . ." [52, p. 129].

[11] See, for example, the literature assembled by Rosenberg [70].

[12] For a review of the literature on induced innovation see Ahmad [1]; Hayami and Ruttan [34]; Smith [77].

open up new technical opportunities, which expand the scope for factor substitution, along a perceived innovation possibility frontier or meta-production function. Introduction of this perspective has led to an extension of the neoclassical theory of the firm to demonstrate that it is rational for firms to allocate research and development resources to facilitate the substitution of increasingly less expensive factors for more expensive factors.[13]

The basic limitation of the theory of induced innovation as it now stands is that the discussion has been conducted entirely within the framework of the theory of the firm. *There is no theory of induced innovation in the public sector.* But development processes are not limited to those that are well understood or have been adequately modeled. The specific mechanisms that act to induce technical change in the private sector are a subset of the more complete set of processes that induce learning behavior in the direction established by social priorities within a wide variety of institutional settings.

Empirical investigation of the induced innovation process has not been constrained by the lack of a fully articulated theory of induced innovation. Schmookler's definitive studies suggest that while autonomous discoveries in pure science (those unmotivated by technical or economic objectives) sometimes provide the stimulus for technical change in the science-based industries, most technical change derives from the recognition of a technical problem or opportunity evaluated in economic terms [41, 69, 74].[14]

The work that Yujiro Hayami and I have recently completed goes beyond the earlier literature to demonstrate historically the effective operation of an induced innovation mechanism in public sector research and development similar to the Hicksian theory of induced innovation in the private sector [33, 34]. In both Japan and the United States a common basis for rapid growth in agricultural output and productivity was the adaptation of agricultural technology to the sharply contrasting factor endowments in the two countries. In both countries public and private sector agricultural research developed a remarkable capacity to generate a continuous sequence of innovations in agricultural technology biased toward removing the most serious constraints on growth of agricultural output. In Japan these innovations were primarily biological and chemical. In the United States they were primarily mechanical and engineering. Only in the last several decades has there been what appears to be a movement toward convergence in patterns of technical change in the two countries.

Our empirical tests of the induced innovation hypothesis clearly support the conclusion that the enormous changes in factor proportions and in factor productivity represented a process of dynamic factor substitution associated with nonneutral changes in the production surface induced by secular shifts in relative factor prices. In both the United States and Japan the progress of public sector agricultural research has been powerfully directed by the conditions of resource supply and product demand to the extent that these forces were reflected through factor and product markets. There is also evidence to suggest that in recent years, when the implications of market forces in both factor and product markets have been partially obscured by nonmarket constraints on resource use, there has been substantial misallocation of public sector agricultural research resources.

Let me emphasize that the model of induced innovation that we have developed remains incomplete. It does not possess formal elegance. It does not adequately explain the feedback process by which public sector resource allocation responds to relative factor endowment and factor accumulation or to environmental stress. It has been argued that the failure of public sector allocative processes stems from the absence of an adequate feedback mechanism linking the "political objective function" to performance [14, 60]. For the United States, however, there is a clear presumption that the existence of a decentralized agricultural research system, the state agricultural experiment station, effectively simulated the innovative behavior postulated by the theory of induced innovation.

Induced Institutional Innovation

The rapid rise in the economic value of environmental services is placing increasing stress on traditional social institutions developed in an environment in which access to "common property" environmental services was regarded as a free good. Under present institutional arrangements certain elements of the physical and social environment continue to be undervalued for purposes of market transactions, even though they have become common property resources of great and

[13] Ibid.

[14] Easterlin [27] has utilized an inducement perspective in his analysis of the long-term decline in human fertility in the United States.

increasing value.[15] The effect has been to bias the direction of technical effort toward excessive production of a wide range of residuals and spillover effects.

In this view the environmental stress resulting from pollution and congestion is not simply a by-product of the autonomous forces of technical change. The system of legal and economic institutions that govern the use of common property resources has failed to evolve in a manner consistent with (a) the rising demand for capacity to receive and assimilate the residuals resulting from commodity production and consumption and (b) the shift to the right in the demand for resource amenities associated with high and rising per capita incomes. The effect of continued undervaluation of environmental services has been to induce a pattern of technical change biased in the direction of excess residual production and away from increased efficiency in the supply of resource amenities [43, 77].

Let me emphasize this point. Traditional production theory implies that if the price of a factor input is zero (or close to zero) that factor input will be used until the value of its marginal product approaches zero. This will occur even though the marginal social product may be negative. In an environment characterized by rapid economic growth, technical change induced by relative factor prices will result in a bias in the direction of technical change, and the demand for a resource that is priced below its social cost will grow more rapidly than in a situation where substitution possibilities can occur only along a "given" production surface. As a result, the "common" resource (the capacity of the environment to absorb residuals, for example) will undergo stress more rapidly than in a world characterized by a constant level of technology, or even by "neutral" technical change. The effect is to accelerate the widening of the gap between the private and social costs of environmental services.

This process has been clearly apparent in agriculture. One effect of the agricultural commodity programs has been to make land more expensive [38]. At the same time, the capacity of the environment to absorb the residuals from crop and livestock production has been treated as a free good. As a result, scientific and technical innovation in both the public and private sectors has been overly biased toward the development of land substitutes—plant nutrients and plant protection chemicals and crop varieties and management systems that reflected the overvaluation of land and undervaluation of the social costs of the disposal of residuals from agricultural production processes.[16] In retrospect it seems apparent that the same biases in factor prices have led to underinvestment in technological effort directed toward pest and soil management systems consistent with the social value of environmental services.

Such examples are not of course restricted to agriculture. Nor do I want to underestimate the positive contribution of the programs initiated in the 1930's and 1940's to stabilize an inherently unstable sector of the economy and to reduce soil erosion, a dominant environmental issue a generation ago. The significance of the example is simply that the environmental stress now being experienced would have occurred more slowly in an environment in which the direction of technological effort was not itself responsive to distortions in the pricing of both conventional factor inputs and environmental services.

Redirection of technical effort in response to the rising economic value of environmental services will involve complex interaction between technical and institutional change. Extension of the theory of induced innovation to include the process of institutional innovation adds significantly to our understanding of this process. *It seems consistent with historical experience to view institutional change as resulting from efforts of economic units (households, firms, bureaus) to internalize the gains and externalize the costs of economic activity and efforts by society to force economic units to internalize the costs and externalize the gains.* Where internalization of the gains of innovative activity are difficult to achieve, institutional innovations involving public sector activity become essential. The socialization of much of agricultural research, particularly the research leading to advances in biological technology, represents an example of public sector institutional innovation designed to realize for society the potential gains from advances in agricultural technology. The political and legislative history of farm price programs, from the mid-1920's to the present, can be viewed as a

[15] The reader is referred to Bator [5] for a review of economic thought with respect to the sources of market failure. See also Kneese [44].

[16] Headley [36] estimates that if the present land held out of production by government programs were returned to production, present levels of output could be maintained with pesticide use at about 20 percent of present levels. See also Headley [35, 37], Brewer [15], and Heady [38].

struggle between agricultural producers and society generally regarding the partitioning of the new income streams resulting from technical progress between agricultural producers and consumers.

The environmental movement, in spite of its extra baggage (including its extensive "demonology" and its resurrection of discarded concepts from the underworld of science) is contributing to the creation of a social and political environment in which it may become feasible to more adequately institutionalize the redirection of technological effort and carry through the reforms necessary to redefine the ownership rights in an increasingly valuable set of common property resources.

Guidelines for Environmental Policy

It seems clear at this time that any significant progress in resolving the conflict arising out of growing demands for environmental services must involve a redefinition of property rights in such a way that innovative activity in both the private and the public sector can be appropriately guided by explicit and pervasive economic and social incentives. This is of course not a new process in western economic development; the modernization of land tenure relationships, including the elimination of the commons and the shift from share tenure to lease tenure and owner-operator cultivation in much of western agriculture, was in large part the result of an effort to achieve a system of property rights that would permit individual farmers to internalize part of the gains from innovative activity.

I would like to suggest several guidelines for the institutional reforms that are now needed if we are to achieve effective development and management of our environmental resources.

First, the principal limitation of the ecological perspective stems from its preoccupation with the adaptive behavior of an interdependent biological community under a stable set of ecological interrelationships [25]. But the concept of equilibrium, however valid it may be as an analytical tool, is clearly misleading as a guide to environmental policy and planning. Robbins [67, p. 143] taught us years ago that in economics "equilibrium is just equilibrium." There have been similar challenges in ecology to the "climax" theories of ecological succession [65].

Much of recent discussion of resource and environmental policy has in my view been too narrowly based (a) on analogies with stable, or even "dynamically" stable, microsystems borrowed from bioecology and (b) on the ultimate global implications of basic geophysical principles [30]. These models provide too little scope for learning behavior leading to the higher levels of system performance that are characteristic of viable social systems. The discount rate that I apply to my own activity forces me into a somewhat shorter time perspective than the eventual "running down" of the universe implied by the second law of thermodynamics. Comments that the levels of production and consumption, rather than the form of production and consumption technology, determine the environmental impact because they do not "reduce the mass of residuals but only change their form" are not particularly enlightening. The form, location, and durability of residuals is a central issue! The implications for quality of life of the discharge of raw sewage in the Potomac River and of organic wastes from sugar beet processing in the Red River Valley is not a simple function of the size of the biochemical oxygen demand (BOD) imposed on regional watercourses.[17]

Second, the historical decline in relative importance of the natural resource component in economic activity, resulting from technical change and changes in consumer behavior, means that we have already sharply reduced the cost of preservation of a broad class of resource amenities. In a relatively affluent society we give up very little real economic growth by the preservation of rare natural amenities [46]. Failure to harvest the timber or mineral resources of the Boundary Waters Canoe Area or the High Sierras or to develop the potential power resources of unique natural features such as the Grand Canyon or Hell's Canyon will have no measurable impact on national economic growth.

Third, redirection of scientific and technological effort along a path induced by environmental stress is an essential component of any effort to achieve consistency between viable development of the social environment and the natural environment. The capacity of the social system to achieve substantial increases in performance will depend on its ability to achieve productivity growth—to identify new and more efficient sources of growth in the supply of social and environmental amenities [6]. Agriculture, for ex-

[17] Löf and Kneese [49] estimated that in 1950 the sugar beet industry alone accounted for 15 percent of organic wastes coming from all industries. The water residuals load generated by sugar beets has been substantially reduced since that time by process alterations.

ample, can never again release as many workers to other sectors of the U.S. economy as it released during the last four decades. It can never again serve as a "leading" growth sector [72]. I see little likelihood, for example, that alternative transportation systems will replace automobile transportation in the near future unless such systems can yield growth dividends in the form of real cost reductions, including user inputs of time [55].

The redirections of effort, in both the natural and social sciences, toward those areas of social conflict arising out of environmental stress represents an exceedingly difficult challenge to institutional innovation. Much of the investment to support this effort, particularly in the areas of biological technology and the social sciences, must come from the public sector. The spillover effects are so great that there is little inducement for private sector investment to produce the knowledge about the basic physical, biological, and social relationships necessary to resolve the conflicts associated with environmental stress and institutional change.

The public sector has traditionally experienced great difficulty in generating support for research designed to produce social change. There has been an implicit acceptance of the Marxian view that the "mode" or the technology of production should dominate social organization [9, 50]. Let me attempt to clarify. When society invests in plant or in medical science research it anticipates a payoff in terms of technical change—higher national average crop yields and lower mortality rates. When society invests in social science research it anticipates that the results will contribute to the "conservation" of existing social institutions. Yet radical changes in family life, religion, and social and economic organizations have clearly been induced by the sharp decline in the cost of population growth resulting from advances in agricultural and health technology. These changes serve to identify the public health and agricultural scientist, not the economist, the psychologist, the sociologist, or the political scientist, as the major source of radical social change in our time. Yet the easiest way for a social science research project to get its budget cut off is to consciously design a research program to produce social change. This "head-in-the-sand" approach to institutional innovation, with its pretense of ethical neutrality, is exceedingly costly to society and may be dangerous to the future of man [25, p. 217].

Fourth, as a general system of environmental management the regulatory approach is a dead end. The history of direct federal or state regulation of large industries is characterized by consistent failure when evaluated either in terms of equity or efficiency. Under the best of circumstances the decision process of the regulatory agencies have become hopelessly mired in technical, legal, and administrative overburden. And over the longer run the regulators have tended to become instruments of the regulated.[18]

This is not to argue that the regulatory approach is not of value in specific instances. A major source of current concern with the impact of technology on the environment is the accelerated rate of advance in science and technology relative to the rate of institutional change. It has also been argued that biological and social systems are characterized by threshold or overload phenomena: "The road that suddenly jams up when one more car appears on it, the river that refuses to clean itself up under a single addition of sewage . . ." [12]. These characteristics clearly call for investment in a much more extensive system of monitoring and assessment of environmental, technological, and social change [58, 80, 81]. The potential payoff to more sensitive monitoring of these systems is extremely high. Direct regulation and prohibition is clearly called for to prohibit those types of environmental pollution from which health hazards and aesthetic offense is obvious, dangerous, and immediate. I also agree with Mishan [52, 53] that direct legal prohibition should be reexamined in terms of its effectiveness in redirecting technical effort.

For the present, however, I would confine subsidization, direct prohibition, and regulation to a much smaller role than in current environmental policy. The decision-making and allocative capacities of both the legislative and judicial systems are clearly overloaded [22]. Institutional systems must be sought that are capable of internalizing incentives for environmental management. Let us hope it will be possible to avoid some of the mistakes which have resulted in the confusion of public and private property rights in water and have contributed to our failure to take fuller advantage of market mechanisms in the allocation of water resources. Clearly the implications—technical, legal, economic, social—of al-

[18] Regulatory agencies seem to have a common life cycle in which the last stage involves staffing of the agency administration from the ranks of the regulated. See Kohlmeier [45], Stigler [79], and the literature cited by Crowe [23].

ternative forms of pollution rights and the organization of "markets" in pollution rights should be well up on the research agenda. There is some indication that this perspective is now receiving more serious consideration in environmental legislation [59].

Fifth, the system of information linkages and incentives designed to guide consumption and production activities and technological effort must be pervasive. The necessary behavior modifications are not confined to the decisions of a few corporate executives or national level decision-makers. Nor can they be achieved through a public relations effort to inspire a new "ethics of conservation."[19] The spatial characteristics of supply and utilization of environmental services represents a serious constraint on the centralization of environmental decision processes. By and large, situations characterized by serious environmental stress are relatively location specific. It is primarily at the level of the region or locality that serious environmental stress occurs and that intensive monitoring and management efforts must be undertaken [43, 44].

The formal analysis on which we can draw for environmental and resource planning and policy is seriously deficient. Analytical capacity seems limited to models which employ, either implicitly or explicitly, inelastic supplies of commodity inputs and environmental services, fixed technical coefficients, highly aggregated production and consumption activities, and "given" consumer tastes [3, 21, 43, 44, 54, 78]. The information requirements of the more sophisticated models that are available seem to preclude their implementation. And even the most advanced models seem unable to incorporate the dynamic properties of the world with which most of us are familiar, including induced changes in technology and the response of consumer tastes and behavior to new opportunities.

This leads me to search for an alternative to "environmental management," in the narrow sense of the term, and to concentrate on the institutional modifications consistent with decentralized decision processes. I see no feasible alternative but to search for institutional innovations capable of establishing property rights with respect to environmental subsystems; the establishment of firms or authorities with appropriate incentives to manage such subsystems; and the use of market or market-like mechanisms to direct the use and production of commodity and service inputs and outputs of such systems [24].

The available analytical models provide weak guides to managerial decision processes by a hypothetical world or national environmental control authority. Yet they do provide some insights into the behavior of households, firms, and bureaucracies—information that is essential in the design of environmental policies to guide the behavior of the firms or authorities established to manage specific environmental subsystems. It seems likely, for example, that the extent to which relative factor and product prices for resource commodities and services reflect relative resource endowments and consumer preferences they will also serve to induce an "efficient" path of technological effort by private and public sector firms, bureaus, and authorities.

Finally, I would like to emphasize that the environmental crisis is not primarily a problem of crisis in man's relationship to nature. Rather it is only one element of a more pervasive crisis in the sociopolitical environment. In most respects, however, the technical difficulties associated with reversing environmental deterioration may be relatively easy. In the case of sociopolitical deterioration the process may be cumulative [42]. In my judgment it is much more important to concern ourselves with deterioration in the sociopolitical environment than of the physical environment.

[19] "The internalizing of new roles of conduct is essential to the effectiveness of ethics in society, but it cannot be obtained solely through efforts focused upon the values and behavior of individuals. . . . Ecologically valid ethics can not be effective until they are internalized in individuals and externalized in social institutions" [7, p. 298].

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