Lecture 11

Efficient and Equitable Taxation

1

Optimal Commodity Taxation

- Assume that the goal is to finance expenditures with a minimum of excess burden.
- Assume lump sum taxes are infeasible.
- 3 commodities:
  - Good X, Y, and leisure
  - Prices P_X, P_Y, and w.

2

Optimal Commodity Taxation

T- time endowment, l=leisure, t=tax rate

$$w(T - l) = P_X X + P_Y Y$$

$$wT = P_X X + P_Y Y + wl$$

$$wT = (1 + t)PX_X + (1 + t)PY_Y + (1 + t)wl$$

$$\frac{1}{1 + t} wT = PX_X + PY_Y + wl$$

3

Optimal Commodity Taxation :
Case 1 – All goods can be taxed

- In this case, the inability to impose a lump sum tax is irrelevant.
- The government can effectively take away a lump sum amount through equal taxes on all commodities (*including leisure*).
- **No excess burden.**

4

Optimal Commodity Taxation:
Case 2 – Not all goods can be taxed

- May be impossible to tax non-market work.
- Assume only taxes can be applied to goods X and Y.
- In general, some excess burden is inevitable. Key question is how to select rates on X and Y to minimize excess burden subject to the revenue constraint.

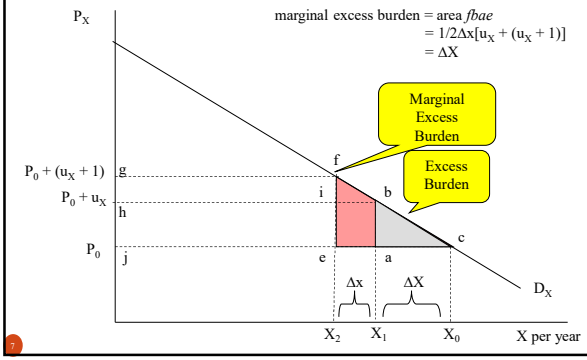
5

Optimal Commodity Taxation:
Ramsey Rule

- Consider the idea of *marginal excess burden*
  - The additional inefficiency from incrementally raising a tax by a small amount.
  - Figure below shows the initial excess burden as a triangle (*abc*), and the marginal excess burden as a trapezoid (*fbae*).

6

Optimal Commodity Taxation:
Ramsey Rule



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7

Optimal Commodity Taxation:
Ramsey Rule

change in tax revenues = area *gfih* – area *ibae*
$= X_2 - (X_1 - X_2)u_X$

marginal tax revenue $= X_1 - \Delta X$

marginal tax revenue per additional dollar of tax revenue
$= \Delta X/(X_1 - \Delta X)$

marginal tax revenue per additional dollar of tax revenue for good Y
$= \Delta Y/(Y_1 - \Delta Y)$

To minimize overall excess burden
$= \Delta X/(X_1 - \Delta X) = \Delta Y/(Y_1 - \Delta Y)$

therefore $\frac{\Delta X}{X_1} = \frac{\Delta Y}{Y_1}$

8

8

Optimal Commodity Taxation:
Ramsey Rule

- Similar reasoning is used for good Y.
- Optimization therefore leads to:

$$\frac{\Delta X}{X_1} = \frac{\Delta Y}{Y_1}$$

- Ramsey rule says that to minimize total excess burden, tax rates should be set so the percentage reduction in the quantity of each good demanded is the same.

9

Optimal Commodity Taxation:
Ramsey Rule reinterpreted

- Recall the formula for excess burden for good X:

$$EB_X = \frac{1}{2}|\eta|P_X X t_X^2$$

- Planner's optimization problem is to minimize total excess burden by choose taxes on goods X and Y, subject to a revenue constraint.

10

Optimal Commodity Taxation:
Ramsey Rule reinterpreted

- Setting up the Lagrangian:

$$\min_{t_X, t_Y, \lambda} L = \frac{1}{2}|\eta_X|P_X X t_X^2 + \frac{1}{2}|\eta_Y|P_Y Y t_Y^2 + \lambda\left(R - P_X X t_X - P_Y Y t_Y\right)$$

11

Optimal Commodity Taxation:
Ramsey Rule reinterpreted

- Solving leads to a relationship between tax rates and elasticities:

$$t_X \eta_X = t_Y \eta_Y$$

- Or rearranging we have the ***inverse elasticity rule***:

$$\frac{t_X}{t_Y} = \frac{\eta_Y}{\eta_X}$$

12

Optimal Commodity Taxation: Ramsey Rule reinterpreted

- Implication of the inverse elasticity rule:
  - As long as goods are unrelated in consumption (neither complements nor substitutes), tax rates should be inversely proportional to elasticities.
  - When good Y is relatively inelastic, tax it more.

13

Optimal Commodity Taxation: Equity Considerations

- Is it "fair" to tax inelastic goods like food and medicine?
  - Clearly it is not.
- Another criteria for a tax system is ***vertical equity***: it should distribute burdens fairly across people with different abilities to pay.

14

Optimal Commodity Taxation: Equity Considerations

- Ramsey rule has been modified to account for the distributional issues.
- Degree of departure from original rule depends on:
  - How much society cares about equity
  - Extent to which consumption patterns of rich and poor differ

15

Optimal User Fees

- If government produces a good or service, must directly choose a ***user fee.***
  - A ***user fee*** is price paid by users of the good or service to the government.
  - For example, ***natural monopoly***.
- What is the "best" fee?

16

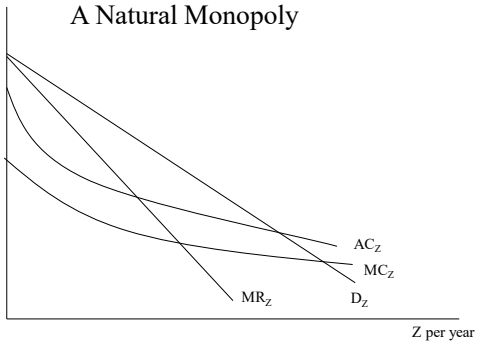
Optimal User Fees

- Consider the natural monopoly in Figure 14.2.
  - Continually decreasing average costs
  - Marginal cost lies everywhere below average cost

17

Optimal User Fees

A Natural Monopoly



18

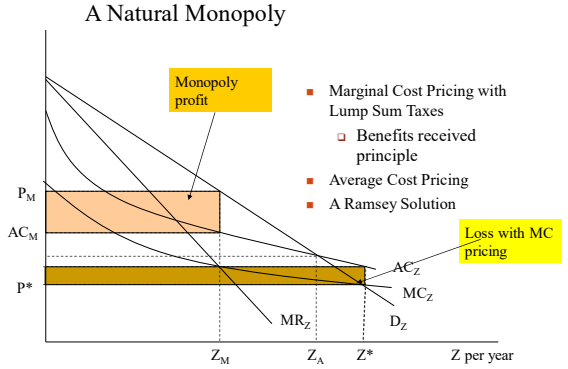
Optimal User Fees

- A private firm would set MR=MC, and choose Z_m. This output level leads to inefficiency.
- See Figure below

19

Optimal User Fees

A Natural Monopoly



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Optimal User Fees

- Efficiency would require P=MC, or output at Z^*.
- Key problem is that at this quantity, price is less than average cost, so the operation suffers losses.

21

Optimal User Fees

- Policy solutions:
  - ***Average cost pricing***: Zero profits, but $Z_A<Z^*$.
  - ***Marginal cost pricing with Lump Sum Taxes***: Set P=MC, provide Z^* at a loss, and finance it with a lump sum tax.
    - Assumes such a tax is available
    - Equity considerations – who uses the good?

22

Optimal User Fees

- Second principle is called the ***benefits-received principle*** – consumers of a publicly provided service pay for it.
- A Ramsey Solution
  - If government is running several enterprises, choose markup over marginal costs subject to a breakeven constraint.

23

Optimal Income Taxation

- $\mathbf{W = U_1 + U_2 + \ldots + U_n}$
- Individuals have identical utility functions that depend only on their incomes
- Total amount of income fixed
- Implications of model for income tax

24

Optimal Income Taxation

- Edgeworth's model implies a radically progressive tax structure: marginal tax rates on high income individuals are 100%.
- Key problem is work incentives are not accounted for.

25

Optimal Income Taxation: Modern studies

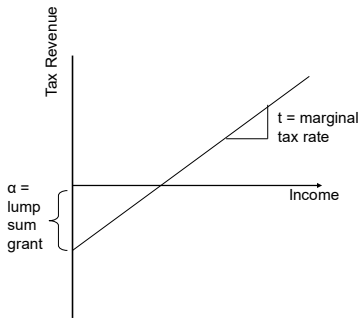
- Account for work disincentives.
- Tax schedule is characterized by:

$$revenue = -\alpha + t \times Income$$

- Figure below shows this equation

26

Optimal Income Taxation: Modern studies



27

Optimal Income Taxation: Modern studies

- This schedule is referred to as a ***linear income tax schedule*** (or a flat income tax).
- Higher values of t mean more progressive tax but larger excess burdens.
- Optimal income tax finds right combination of α and t.

28

Optimal Income Taxation: Modern studies

- Typical findings of optimal income tax problems:
  - Allowing for modest amount of substitution between leisure and income leads to income tax rates considerably less than 100%.

29

Other Criteria for Tax Design

- Horizontal equity: People in equal positions should be treated equally
  - Measures represent outcomes of people's decisions so it is difficult to figure out whether they were initially in equal position.
- Costs of running a tax system
  - Tax *evasion*
  - Tax *avoidance*

30

Tax Evasion

- ***Tax evasion*** is failing to pay legally due taxes.
- Tax cheating difficult to measure, and probably manifests itself in a number of ways:
  - Keeping two sets of books
  - Moonlighting for cash
  - Barter
  - Deal in cash

31

Tax Evasion

- Suppose person cares only about maximizing expected income
  - Goal is to choose *R*, the amount that is hidden from authorities
  - Marginal benefit of hiding income is the tax rate
- Assume authorities randomly audit with probability ρ, and increasing penalty for greater amounts hidden.

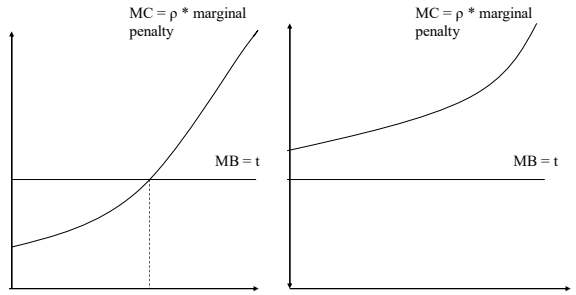
32

Tax Evasion

- Figure below shows that optimal underreporting occurs when the expected marginal benefit from doing so exceeds the marginal cost.
  - Implications: Cheating increases with tax rates and decreases with enforcement.

33

Tax Evasion



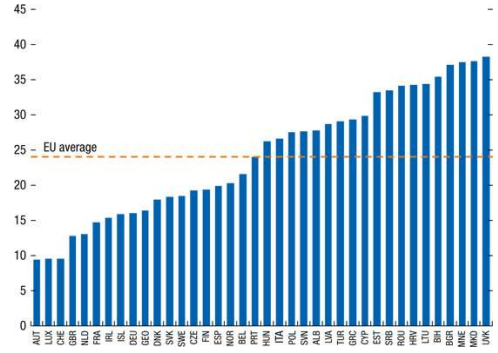
34

Tax Evasion

- Ignores a number of real-world aspects:
  - Psychic costs of cheating
  - Risk aversion
  - Work choices
  - Probabilities of audit

35

The Size of the Shadow Economy in European Countries, 2019
(Percent of GDP)
Source: IMF staff calculations.



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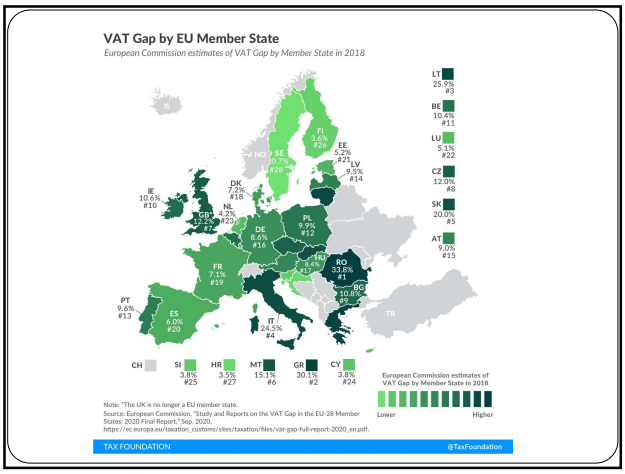

37

Tax avoidance

Photo courtesy of Age Fotostock. © Age Dotostock

38

38

Tax avoidance

Photo courtesy of Jonathan Meer. © Jonathan Meer

39

39

Tax avoidance

40

40

U.S. company foreign profits relative to GDP, 2010

	Profits as a percent of GDP
Canada	3.3
France	0.6
Germany	0.4
Italy	0.3
Japan	0.4
UK	2.1
Weighted average, G-7	0.7

	Profits as a percent of GDP
Cyprus	13.6
Ireland	41.9
Luxembourg	127.0
Netherlands	17.1
Switzerland	12.3
Panama	0.1
Singapore	4.7
Hong Kong	2.6

Larger countries on tax haven lists and Netherlands

Source: Jane G. Gravelle, *Tax Havens: International Tax Avoidance and Evasion*, Congressional Research Service, 1/15/2015

41

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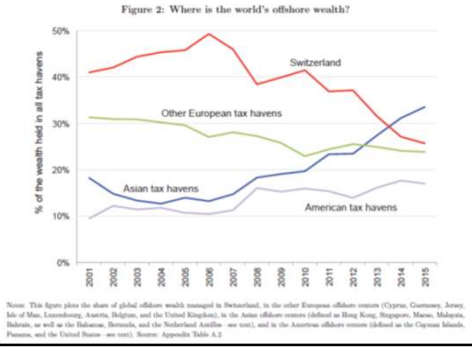
	Profits as a percent of GDP
Bahamas	70.8
Barbados	5.7
Bermuda	1,614.0
British Virgin Islands	1,803.7
Cayman Islands	2,065.5

Smaller countries on tax haven lists

Source: Jane G. Gravelle, *Tax Havens: International Tax Avoidance and Evasion*, Congressional Research Service, 1/15/2015

42

Alstadseater et al (2017)
Who owns the wealth in tax havens?



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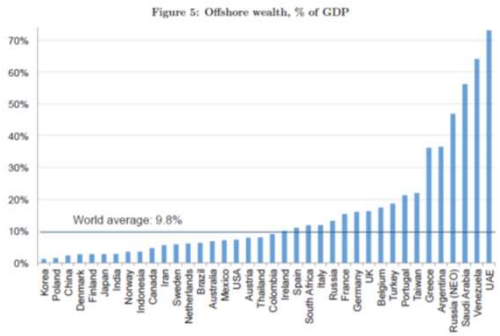
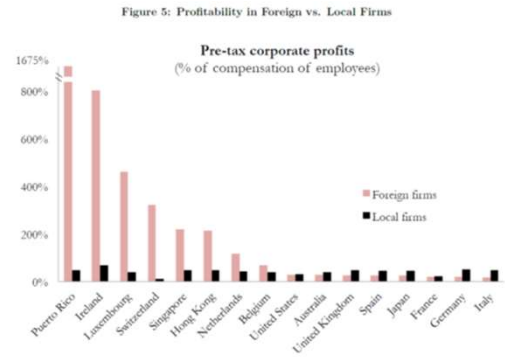


44

Torslov, Wier, Zucman (2020),
The Missing Profits of Nations



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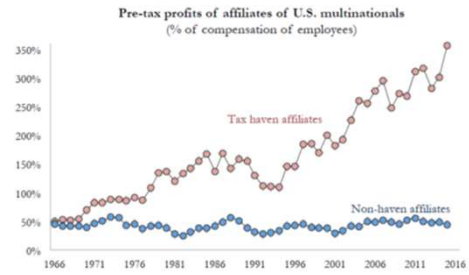

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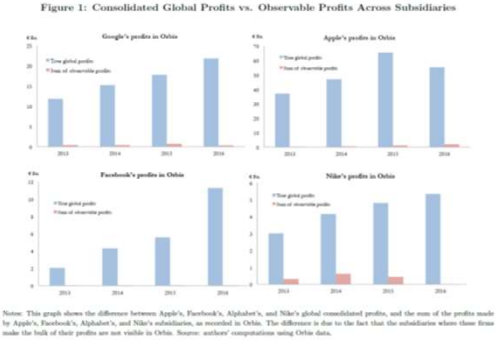

48

Recap of Efficient and Equitable Taxation

- Optimal Commodity Taxation
  - All goods taxed
  - Only some taxed
- User fees
- Optimal Income Taxation
- Tax Evasion