Lecture 11

Efficient and Equitable Taxation

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.

Optimal Commodity Taxation

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

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

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

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

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

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.**

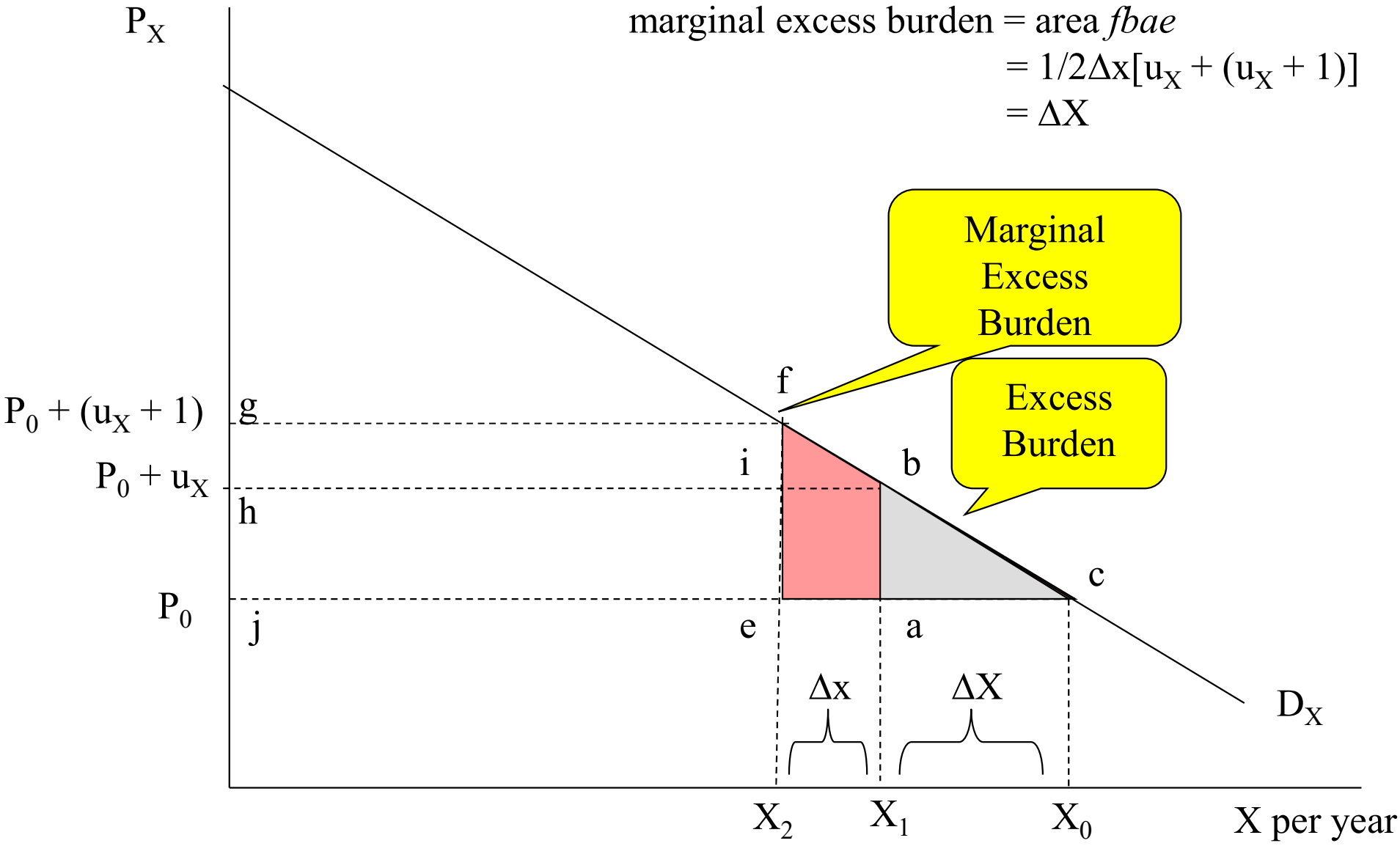
Optimal Commodity Taxation:
Case 2 – Not all goods can be taxed

- 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.

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*).

Optimal Commodity Taxation:
Ramsey Rule



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

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.

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.

Optimal Commodity Taxation:
Ramsey Rule reinterpreted

- Setting up the Lagrangian:

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

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*:**

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

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.

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.

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

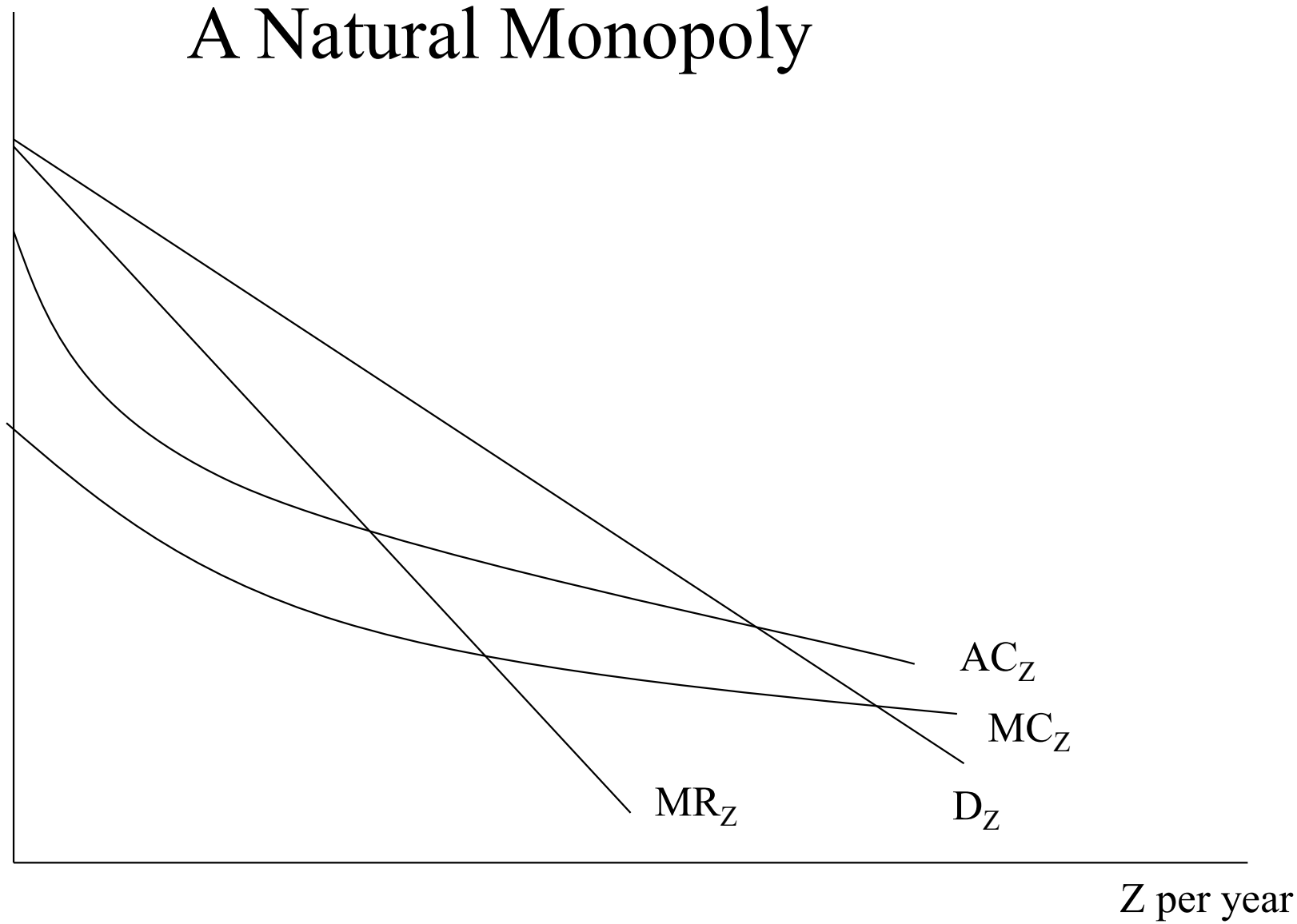
Optimal User Fees

- 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?

Optimal User Fees

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

Optimal User Fees

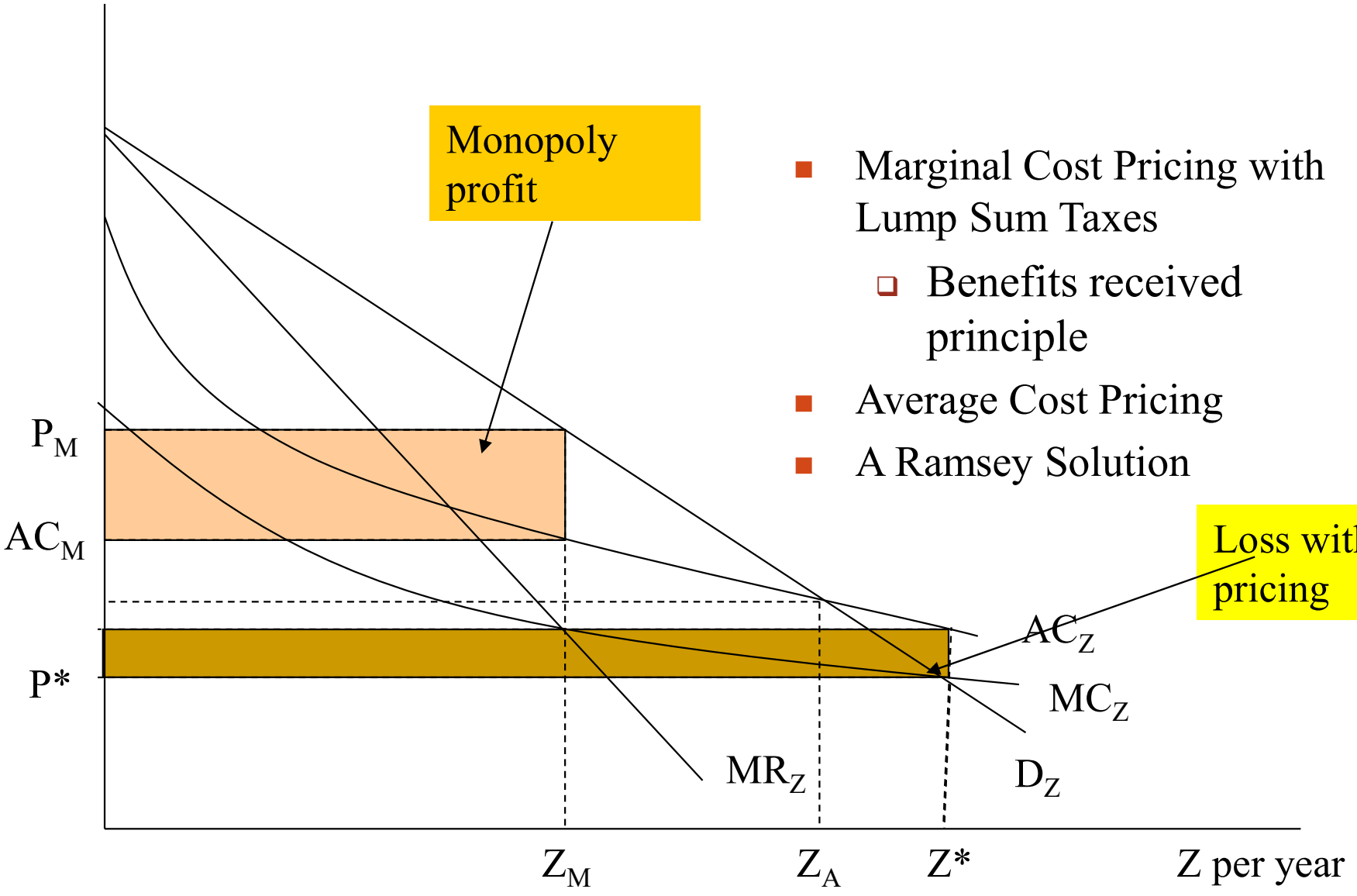


Optimal User Fees

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

Optimal User Fees

A Natural Monopoly



- Marginal Cost Pricing with Lump Sum Taxes
  - Benefits received principle
- Average Cost Pricing
- A Ramsey Solution

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.

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?

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.

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

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.

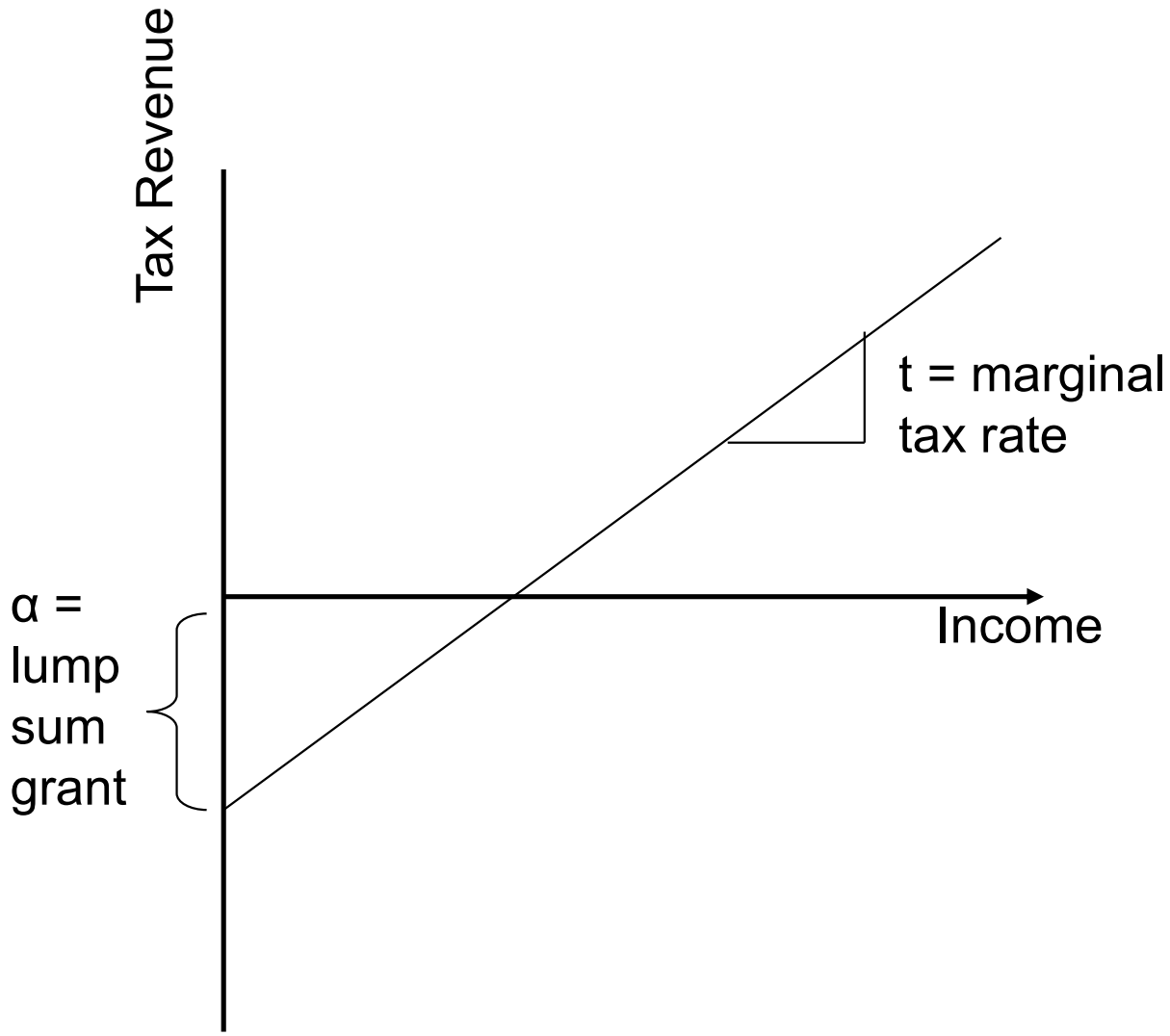
Optimal Income Taxation:
Modern studies

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

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

- Figure below shows this equation

Optimal Income Taxation:
Modern studies



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.

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%.

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*

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

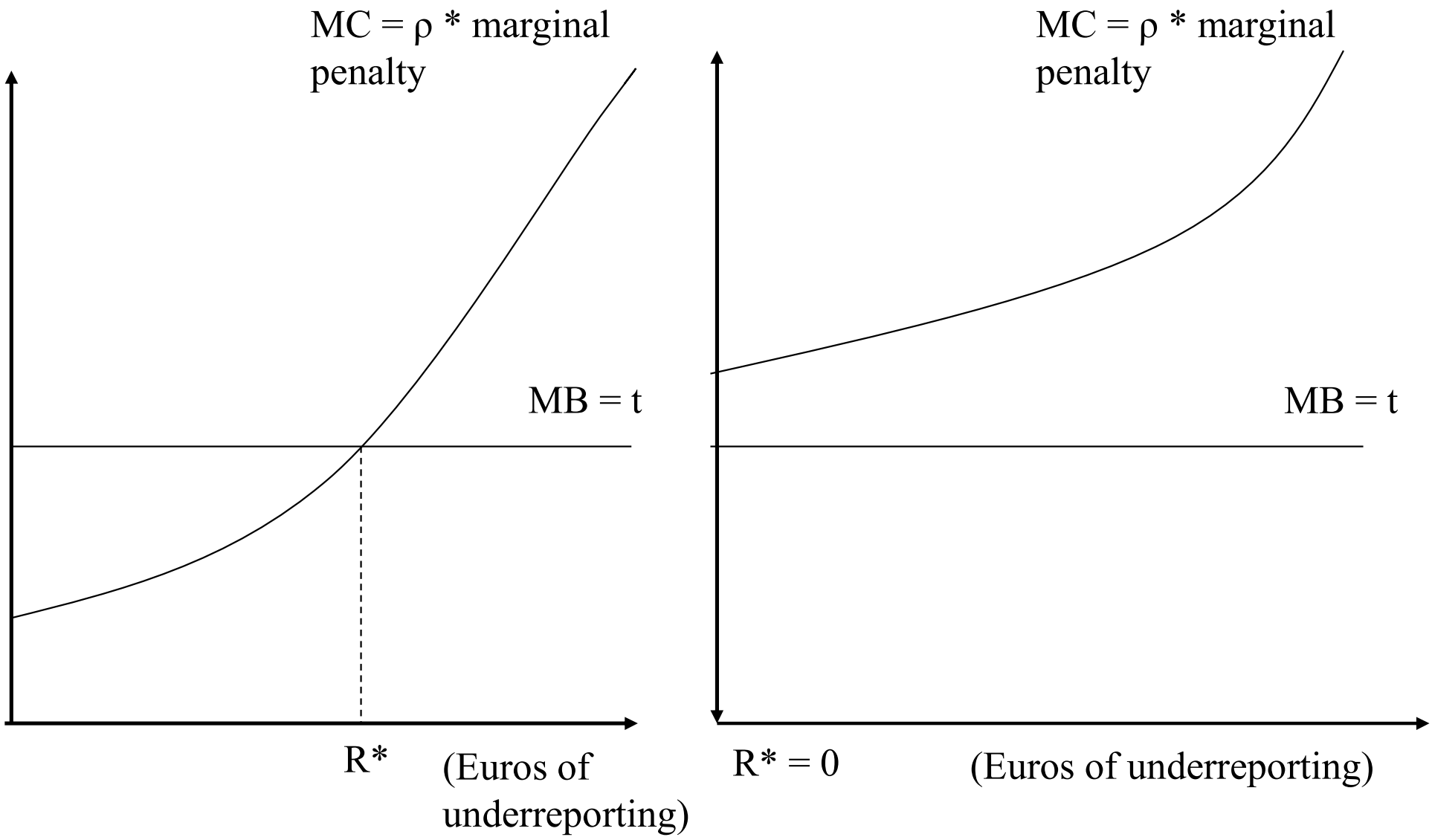
Tax Evasion

- 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.

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.

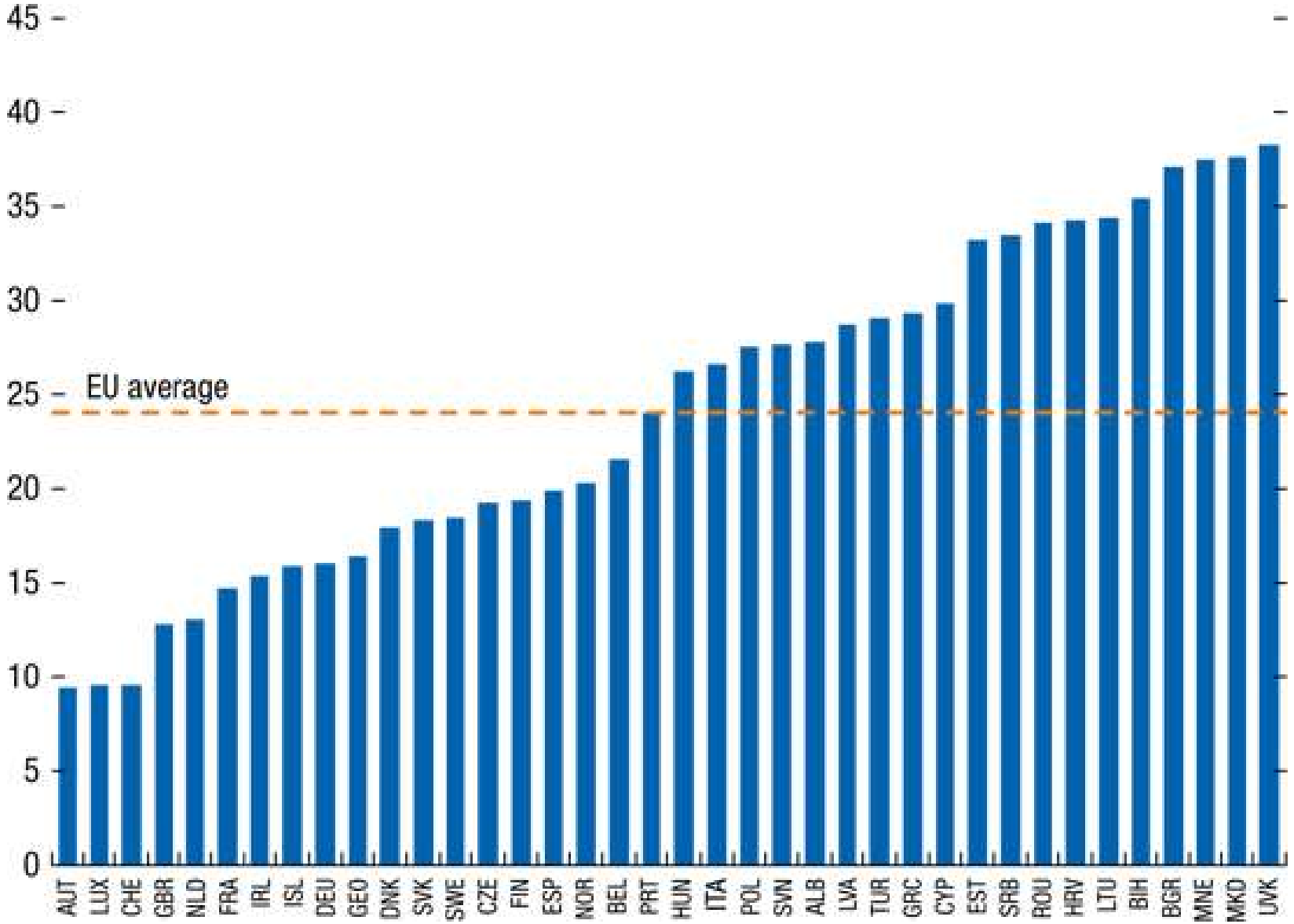
Tax Evasion


MC = ρ * marginal penalty
MB = t
R*
(Euros of underreporting)
MC = ρ * marginal penalty
MB = t
R* = 0
(Euros of underreporting)

Tax Evasion

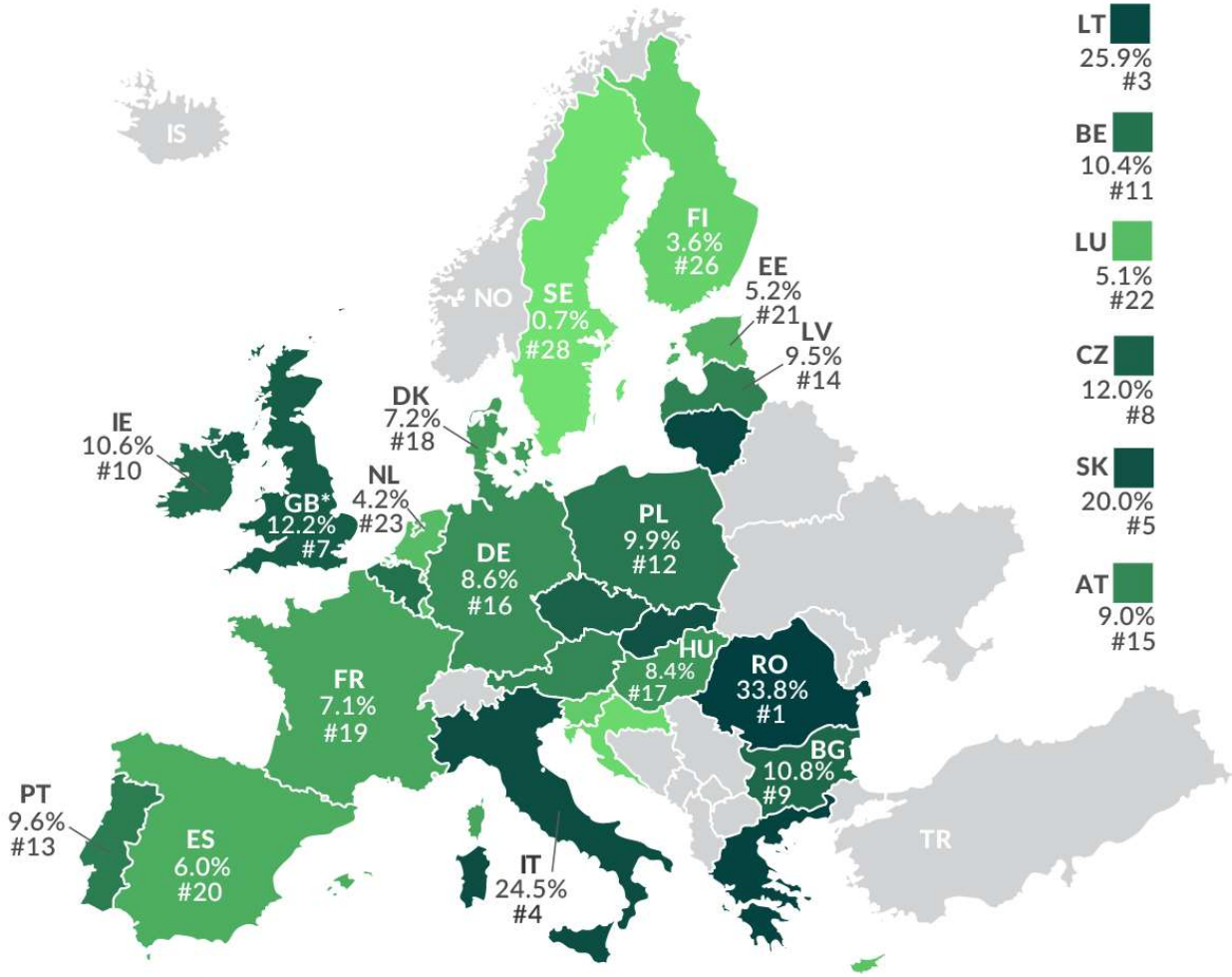
- Ignores a number of real-world aspects:
  - Psychic costs of cheating
  - Risk aversion
  - Work choices
  - Probabilities of audit

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



VAT Gap by EU Member State

European Commission estimates of VAT Gap by Member State in 2018



Note: *The UK is no longer a EU member state.

Source: European Commission, "Study and Reports on the VAT Gap in the EU-28 Member States: 2020 Final Report," Sep. 2020, https://ec.europa.eu/taxation_customs/sites/taxation/files/vat-gap-full-report-2020_en.pdf.

Tax avoidance

Photo courtesy of Age Fotostock. © Age Dotostock

Tax avoidance

Photo courtesy of Jonathan Meer. © Jonathan Meer

Tax avoidance

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

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Switzerland	12.3
Panama	0.1
Singapore	4.7
Hong Kong	2.6

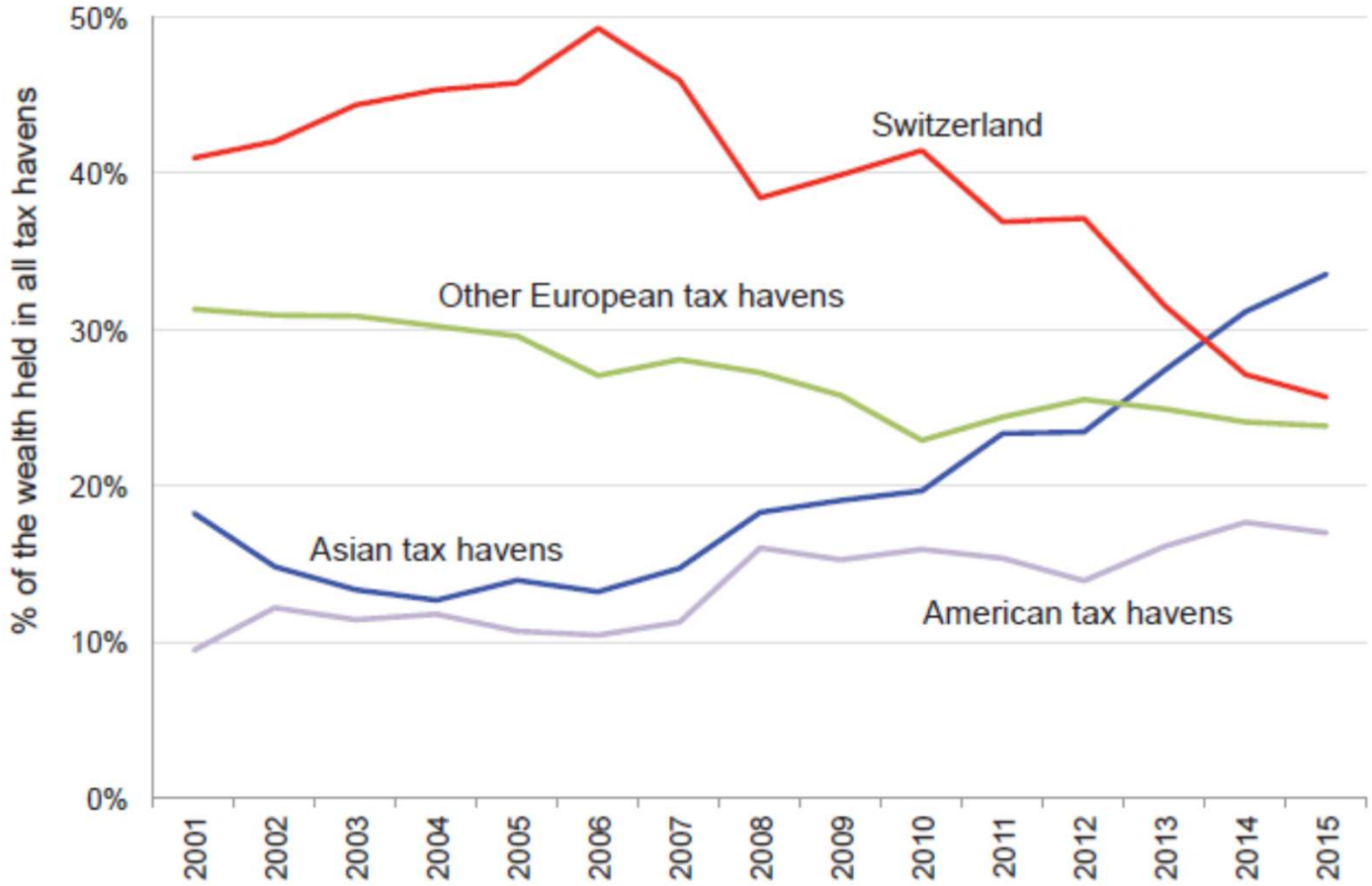
	Profits as a percent of GDP
Bahamas	70.8
Barbados	5.7
Bermuda	1,614.0
British Virgin Islands	1,803.7
Cayman Islands	2,065.5

Smaller countries on tax haven lists

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

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

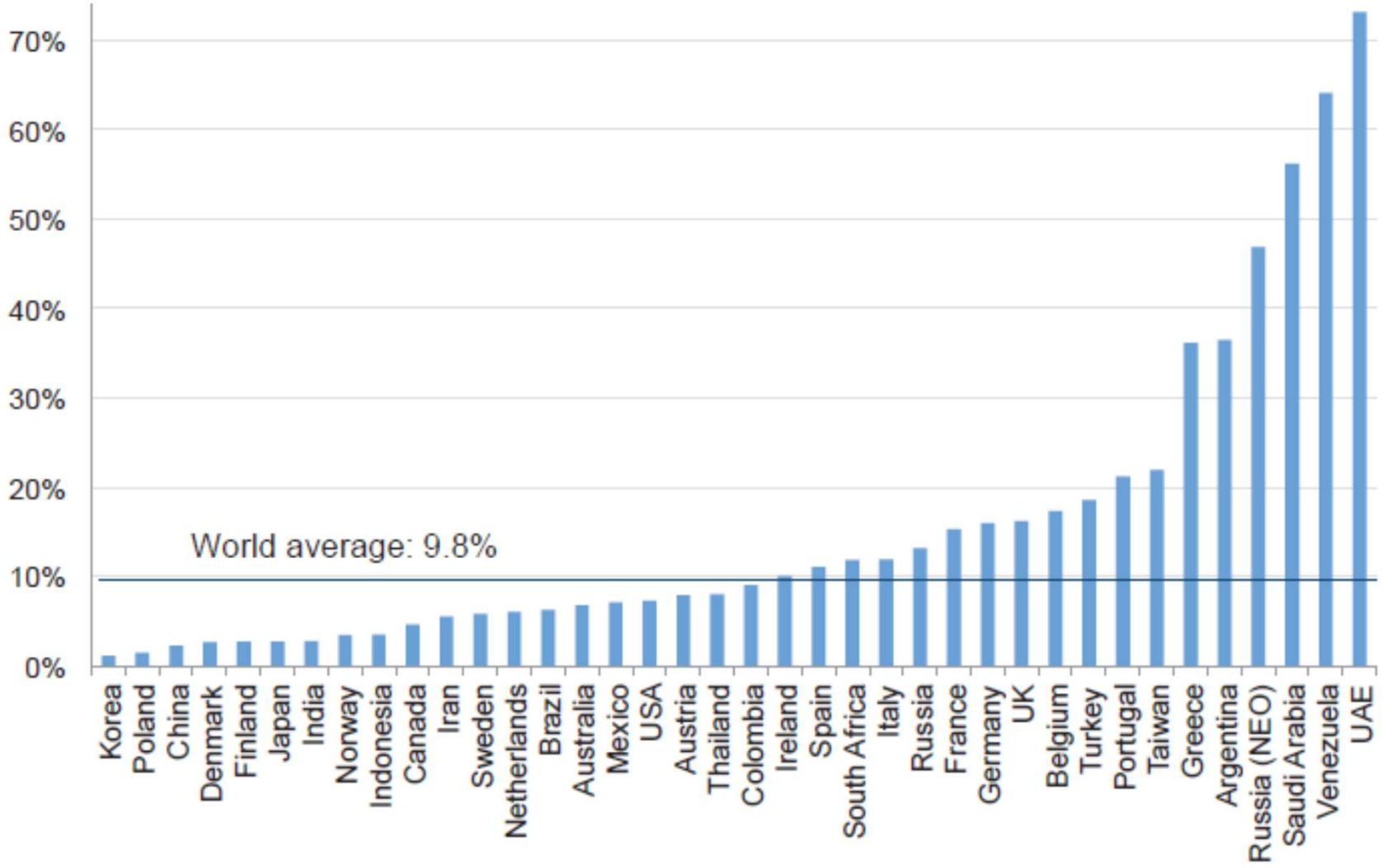
Figure 2: Where is the world's offshore wealth?



Notes: This figure plots the share of global offshore wealth managed in Switzerland, in the other European offshore centers (Cyprus, Guernesey, Jersey, Isle of Man, Luxembourg, Austria, Belgium, and the United Kingdom), in the Asian offshore centers (defined as Hong Kong, Singapore, Macao, Malaysia, Bahrain, as well as the Bahamas, Bermuda, and the Netherland Antilles—see text), and in the American offshore centers (defined as the Cayman Islands, Panama, and the United States—see text). Source: Appendix Table A.2

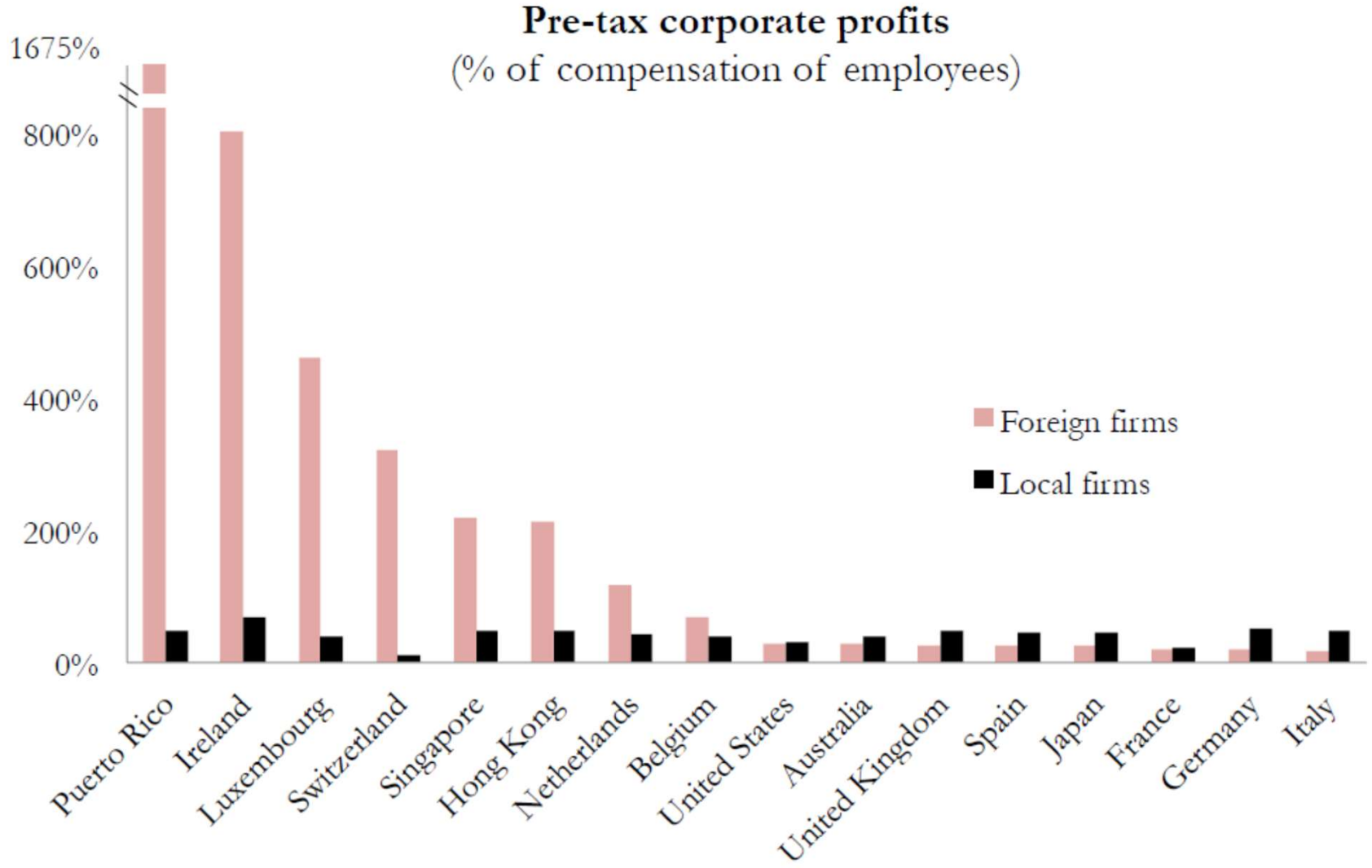
Alstadseater et al (2017)
Who owns the wealth in tax havens?

Figure 5: Offshore wealth, % of GDP

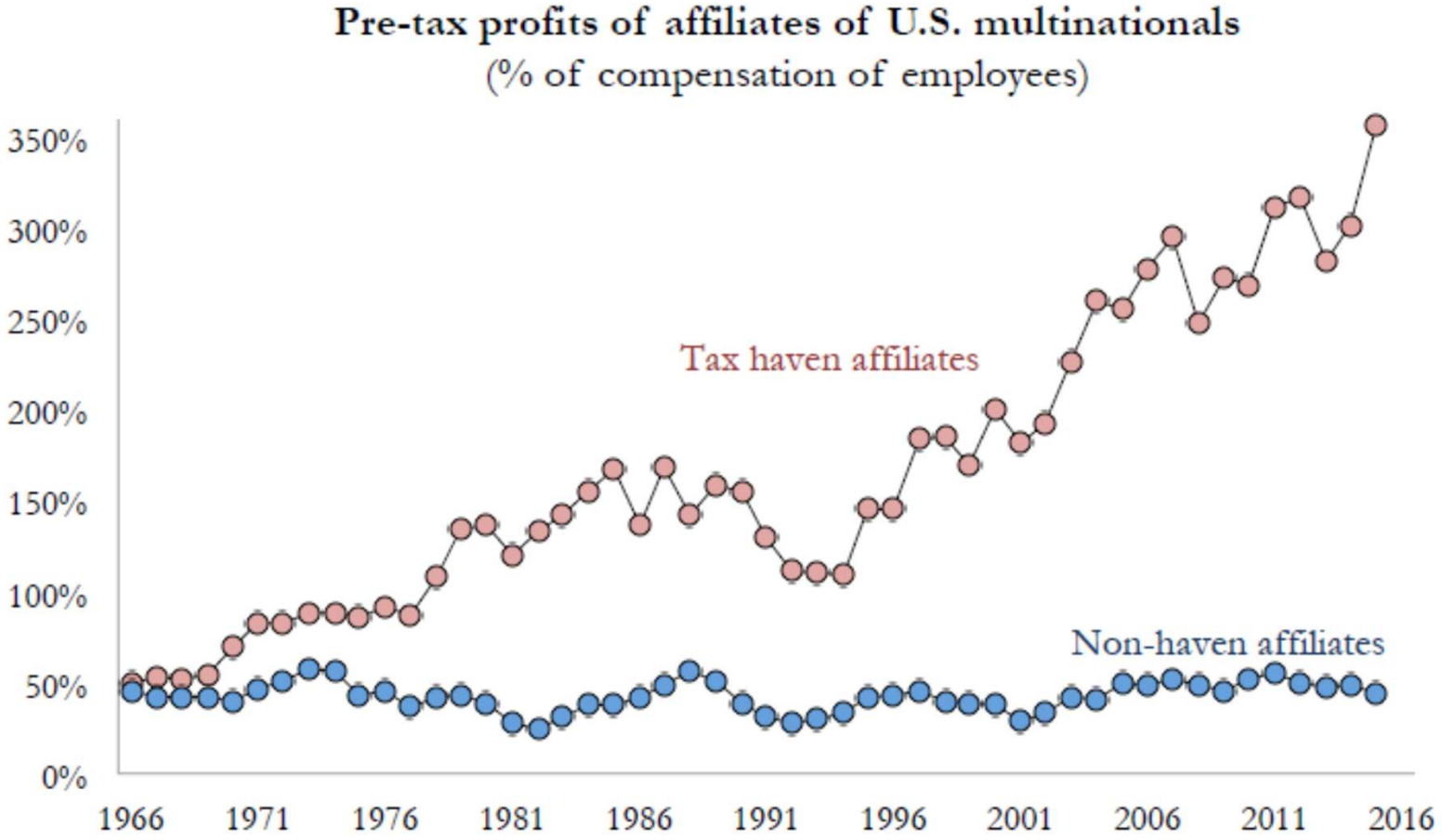


Torslov, Wier, Zucman (2020), The Missing Profits of Nations

Figure 5: Profitability in Foreign vs. Local Firms

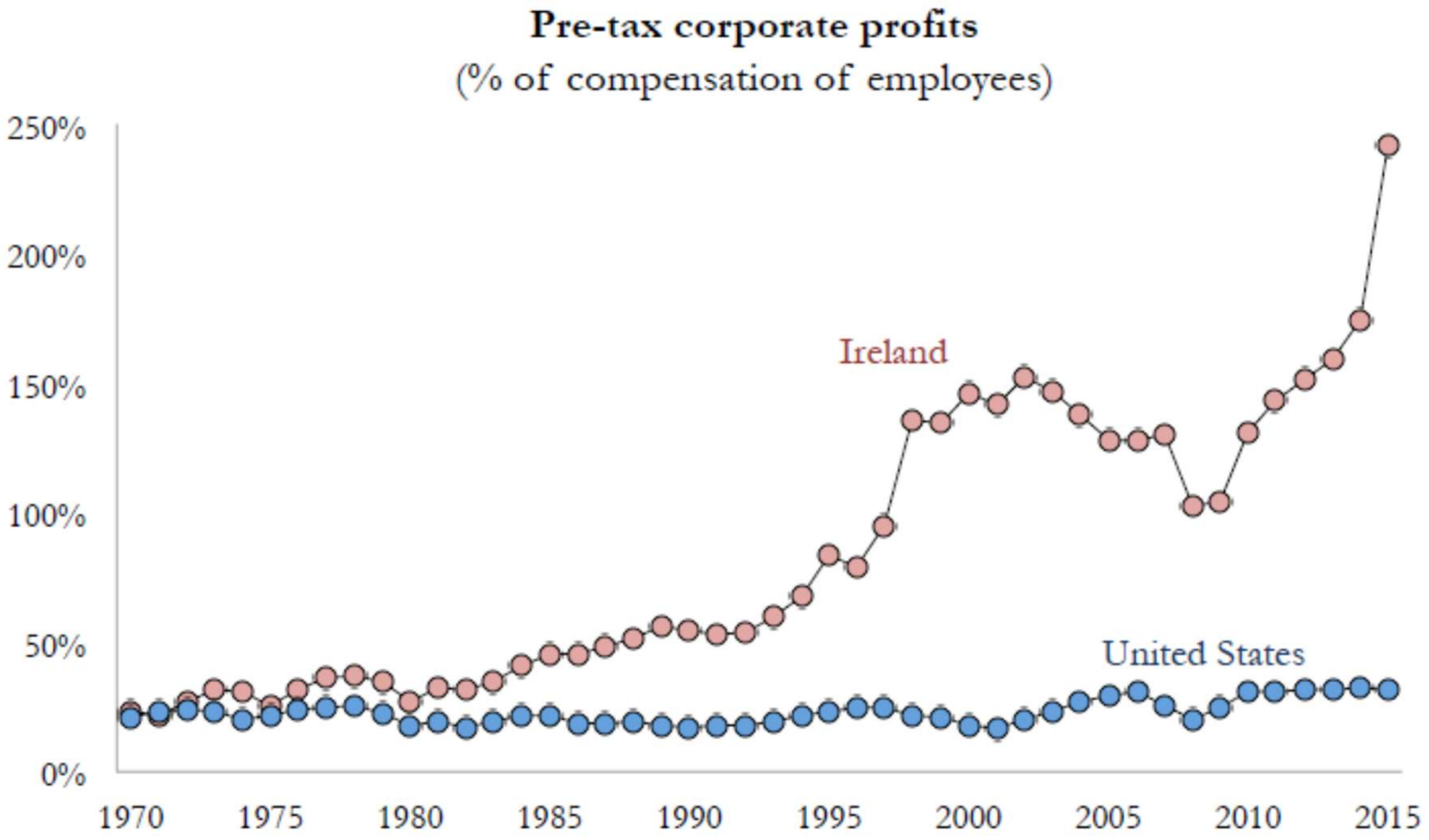


Torslov, Wier, Zucman (2020), The Missing Profits of Nations



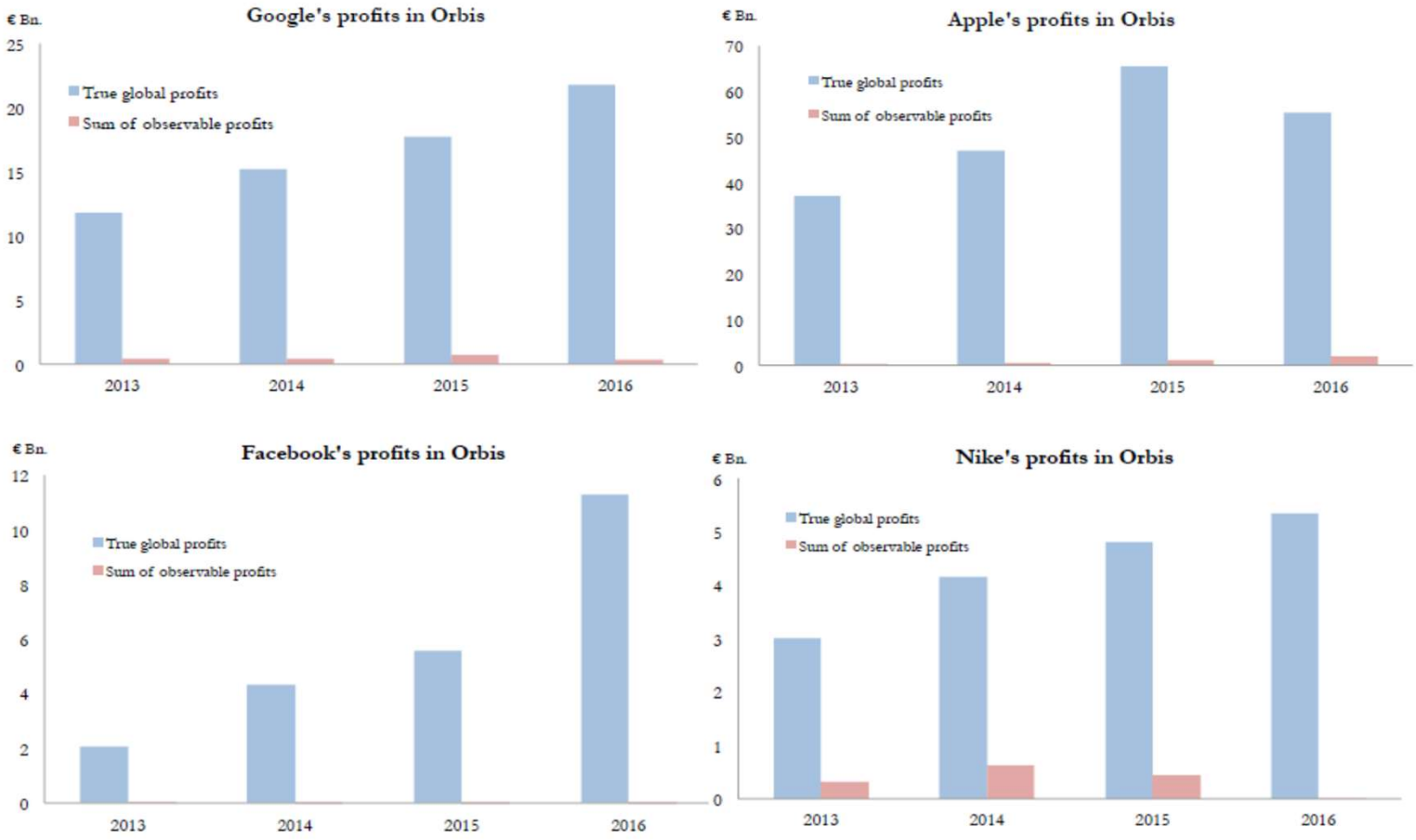
Torslov, Wier, Zucman (2020), The Missing Profits of Nations

Figure 4: The Rise of Profit Shifting



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

Figure 1: Consolidated Global Profits vs. Observable Profits Across Subsidiaries



Notes: This graph shows the difference between Apple's, Facebook's, Alphabet's, and Nike's global consolidated profits, and the sum of the profits made by Apple's, Facebook's, Alphabet's, and Nike's subsidiaries, as recorded in Orbis. The difference is due to the fact that the subsidiaries where these firms make the bulk of their profits are not visible in Orbis. Source: authors' computations using Orbis data.

Recap of Efficient and Equitable Taxation

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