

# Multinationals and the Globalization of Production

## *International Taxation*

Penn State // Fall 2016

## Administrative things

- ▶ VOTE
- ▶ Please sign in to Arkaive.com
- ▶ Exam 2
  - ▶ Pick up from up front
- ▶ No class 11/22 & 11/24
- ▶ Final exam
  - ▶ Tuesday December 13, 2:30PM–4:20PM
  - ▶ Willard 073

## Exam II

- ▶ Score is on page 9 (its circled)
- ▶ Mean = 72, std = 17, max = 100
- ▶ [25th, 50th, 75th] percentile = [60, 75, 87]
- ▶ Exam 1 + Exam 2 = 50% total grade
  - ▶ [25th, 50th, 75th] percentile = [58, 70, 78]
- ▶ Solutions online

## Regrading

- ▶ Points added wrong? See me after class.
- ▶ Would like a question regraded?
  - ▶ Look over the solution.
  - ▶ Complete exam regrade request form (on course website).
  - ▶ On the form, explain why your answer is correct.
  - ▶ Turn in regrade form and your exam to me.
  - ▶ Entire exam is regraded. Score could decrease.
- ▶ Deadline for regrade request: end of class Tuesday 11/15

## Question 1

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- ▶ Consider the two country model of vertical FDI that we developed in class. When the cost of trading the first-stage good is zero ( $\tau_b = 0$ ), the firm will choose either complete fragmentation or exporting as its production structure.

## Question 2

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- ▶ When evaluating the impact of a foreign investment on the local labor market, the analysis needs to consider the ease with which workers can move within the country.

### Question 3

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- Goods  $x$  and  $y$  are produced using electricity ( $e$ ) and labor ( $\ell$ ). The production function for good  $x$  is  $x = \min\{\frac{\ell}{2}, \frac{e}{3}\}$ . The production function for good  $y$  is  $y = \min\{\frac{\ell}{1}, \frac{e}{3}\}$ . Electricity prices in countries 1 and 2 are  $p_e^1 = 5$  and  $p_e^2 = 8$ . Wages in countries 1 and 2 are  $w^1 = 10$  and  $w^2 = 3$ . If trade costs for both  $x$  and  $y$  are zero, then country 1 specializes in good  $x$  and country 2 specializes in good  $y$ .

## Question 4

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- ▶ The *productivity composition effect* is the increase in aggregate productivity in the host country that results from the fact that foreign affiliates operating in the host country are larger than local firms.

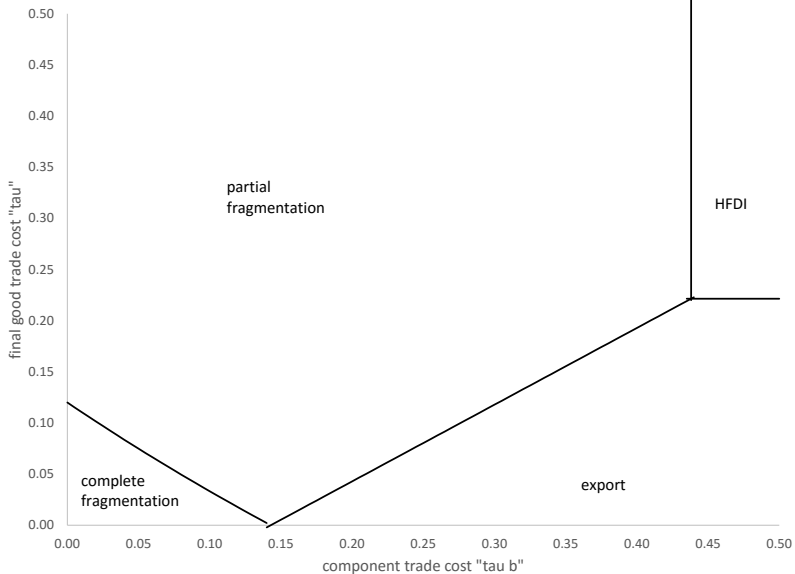


## Question 5

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- Country 2 is interested in increasing its inward direct investment. Currently, firms from country 1 are serving country 2 by exporting. There are two proposals under consideration:
1. To increase foreign investment in country 2, *increase* tariffs on imports into country 2.
  2. To increase foreign investment in country 2, *decrease* tariffs on imports into country 2.

Explain how both of these proposals could be successful. Your answer should discuss what tariffs should be changed, and what kinds of foreign direct investment the proposals would attract. You may want to use the figure below to help frame your answer.



## Question 6

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- Carrier air conditioners are made in two stages. First, skilled and unskilled labor are used to design the air conditioning units. Second, skilled and unskilled labor use the designs to manufacture the air conditioning units. The production functions for design ( $d$ ) and assembly ( $a$ ) are

$$d = \min \left\{ \frac{\ell_s}{10}, \frac{\ell_u}{1} \right\}$$
$$a = \min \left\{ \frac{\ell_s}{1}, \frac{\ell_u}{3} \right\},$$

where  $\ell_s$  are the number of skilled labor units used and  $\ell_u$  are the number of unskilled labor units used. An air conditioning unit requires one unit of design services and one unit of assembly. In the United States, wages are  $w_s^U = 25$  and  $w_u^U = 15$  and in Mexico they are  $w_s^M = 35$  and  $w_u^M = 2$ .

## Question 6

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- a. There are no trade costs for using the air conditioner designs in another country ( $\tau_d = 0$ ). The cost of trading the finished air conditioner is  $\tau = 0.05$ . What is the optimal firm structure? Explain your answer.
- b. Suppose the US government can control  $\tau$ . What value of  $\tau$  would make Carrier indifferent between assembling air conditioners in Mexico and exporting them to the United States (~~partial fragmentation~~ complete fragmentation) and producing the entire air conditioner in the United States? Call this value  $\hat{\tau}$ .

## Question 6

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- c. If the US government chooses  $\tau = \hat{\tau} + 0.1$ , by how much does the cost of an air conditioner in the United States increase?
- d. If the US government chooses  $\tau = \hat{\tau} + 0.1$ , how do Carriers' Mexican assembly operations change?

## Question 6

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- e. Suppose that Carrier, for political reasons, will continue to design and assemble air conditioners in the United States, but is considering changing the way it assembles air conditioners. After some research, Carrier devises an assembly method described by

$$a = \min \left\{ \frac{\ell_s}{1.5}, \frac{\ell_u}{1} \right\}.$$

The design production function stays unchanged.

How does the new technology change the cost of producing an air conditioner in the United States? Compute the new price.

- f. How does the new technology change Carrier's relative demand for skilled versus unskilled workers?

## Question 7

- a. One part of your team is to research the impact that the new investment will have on the labor market in Edinburgh. What factors determine the impact on the labor market?
- b. Under what circumstances would the factors you identified in part a. lead to a negative outcome for local firms?
- c. The mayor of Edinburgh is exploring the possibility of offering Siemens an exemption from local taxes for 10 years if they invest in Edinburgh. How should the mayor evaluate the economic merit of this subsidy?

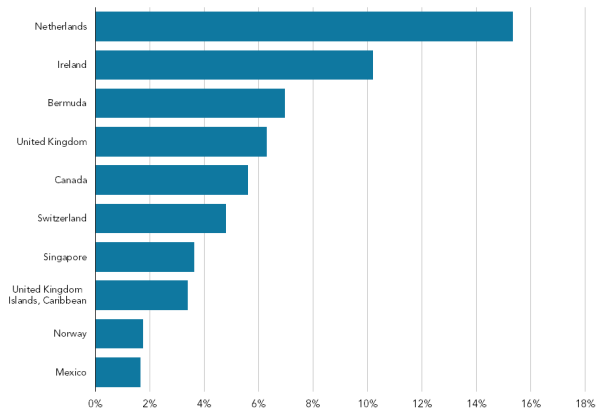
## Roadmap

- ▶ Past: Production motives for FDI
  - ▶ FDI for market access (Horizontal/Export platform)
  - ▶ FDI for factor cost savings (Vertical)
- ▶ Present: Tax motives for FDI
  - ▶ How tax systems influence MNE structure
  - ▶ Tax avoidance strategies
  - ▶ What is a double Irish with a Dutch sandwich?





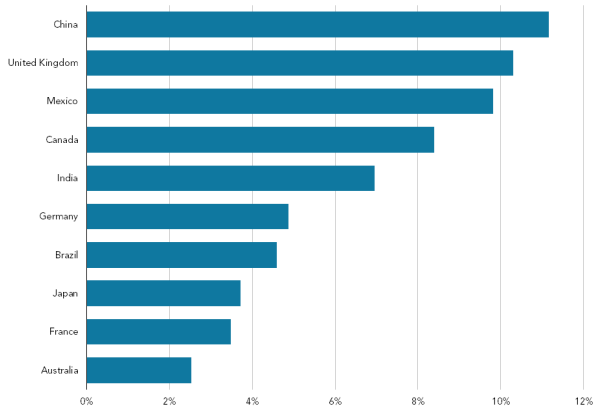
**FIGURE 1**  
Top Countries for Non-US Profits of US Multinationals  
Profits as a percentage of total, 2012



Source: Bureau of Economic Analysis, 2014.

FIGURE 2

Top Foreign Locations for Employment in US Multinationals  
Employment as a percentage of total, 2012



Source: Bureau of Economic Analysis, 2014.

## Simplifications ahead

- ▶ Tax laws differ greatly across countries
- ▶ Tax laws are extremely complicated
  - ▶ Google “international tax practice”
- ▶ We will use simple models to capture ideas
- ▶ Focus mostly on the United States
  - ▶ Drives most tax-related MNE decisions

## Tax principles

**Residence principle** Taxpayer's residence is the basis for taxation. For firms, this is typically the country in which the firm is incorporated. Walmart's residence in the United States.

**Source principle** Where the income is earned is the basis for taxation. Walmart earns income in the United States and Mexico.

- ▶ US taxes its firms on residency basis and foreign firms on source basis
  - ▶ Walmart pays US tax on its total income — wherever it is earned.
  - ▶ Toyota only pays US tax on the income it earns in the US.
- ▶ Foreign profit is taxed when it is repatriated

## Taxing firm profits

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- ▶ Firm earns profits at home  $\pi^H$  and abroad  $\pi^F$
- ▶ Country tax rates are  $\tau^H$  and  $\tau^F$
- ▶ A home country firm pays tax

$$T = \tau^H (\pi^H + \pi^F) + \tau^F \pi^F$$

- ▶ Which taxes the foreign profits twice (double taxation)

$$T = \tau^H \pi^H + (\tau^H + \tau^F) \pi^F$$

## Undoing double taxation

- ▶ Foreign tax credits help offset double taxation
- ▶ A foreign tax credit allows the firm to deduct tax paid in the foreign country against home country tax bill
- ▶  $C$  = the amount of the foreign tax credit

$$T = \tau^H (\pi^H + \pi^F) - C + \tau^F \pi^F$$

- ▶ Other countries exempt foreign income from taxation

## Foreign tax credits

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- ▶ If  $\tau^H \geq \tau^F$ , then  $C = \tau^F \pi^F$

$$T = \tau^H (\pi^H + \pi^F) - \tau^F \pi^F + \tau^F \pi^F = \tau^H (\pi^H + \pi^F)$$

- ▶ If  $\tau^H < \tau^F$ , then  $C = \tau^H \pi^F$

$$T = \tau^H (\pi^H + \pi^F) - \tau^H \pi^F + \tau^F \pi^F = \tau^H \pi^H + \tau^F \pi^F$$

- ▶ Why two different rules?

## Example

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- ▶  $\pi^H = 75, \pi^F = 25, \tau^H = 0.35, \tau^F = 0.2$
- ▶ What is the value of  $C$ ?
- ▶ What is the firm's total tax rate,  $\tau = T/(\pi^H + \pi^F)$ ?
- ▶ What are the tax revenues for  $F$  and  $H$ ?



## In-class example

- ▶  $\pi^H = 75, \pi^F = 25, \tau^H = 0.35, \tau^F = 0.45$
- ▶ What is the value of  $C$ ?
- ▶ What is the firm's total tax rate,  $\tau = T/(\pi^H + \pi^F)$ ?
- ▶ What are the tax revenues for  $F$  and  $H$ ?

## Tax strategy

- ▶ Focus on US tax system
- 1. Do not repatriate foreign profit
  - ▶ Wait for repatriation tax holiday
- 2. Earn profit in low-tax countries
  - ▶ Transfer pricing
  - ▶ Intangible asset location
  - ▶ Inversions

## Do not repatriate foreign profit

- ▶ No U.S. tax liability until profit returns to US
- ▶ Hold profits in foreign subsidiaries
- ▶ Use profits to invest abroad
- ▶ Hope (and lobby) for tax holiday
  - ▶ 2004 US repatriation tax holiday
  - ▶ Firms pay 5.25% tax rate (rather than 35%)
  - ▶ Firms repatriated \$362 bil.
  - ▶ Creates incentive problems (proposed holidays in 2009, 2015)
- ▶ Estimates put current foreign profits abroad at \$2.1 tril.

## Transfer pricing

- ▶ Create foreign affiliate in low-tax country
- ▶ Parent sells affiliate inputs
- ▶ Within firm transactions happen at *transfer prices*
- ▶ How do you set a price for a non-market transaction?
  - ▶ Introduces wiggle room into things...

## Transfer pricing

- ▶ Example: parent produces good  $b$ , “sells” it to affiliate who uses it to make a final good

- ▶ Parent profits

$$\pi^h = p \times b - \text{costs}$$

- ▶ Affiliate profits

$$\pi^f = \text{sales} - p \times b$$

- ▶ Transfer price  $p$  does not change total profit  $\pi^h + \pi^f$
- ▶ Transfer price  $p$  changes how profit is split between  $\pi^h$  and  $\pi^f$
- ▶ If  $\tau^f < \tau^h$  would like  $p$  to be very low

## Transfer pricing

- ▶ Transfer prices are supposed to be valued at *arms-length*
  - ▶ Find similar market transactions, and use that price
  - ▶ In our example: find two unrelated firms buying and selling  $b$
- ▶ Not often possible to find comparable arms-length transactions
  - ▶ Goods and services are unique
  - ▶ Goods and services only transacted intra-firm
- ▶ Tax laws change to eliminate transfer pricing arbitrage
  - ▶ Firms must justify transfer prices
  - ▶ Steep penalties for manipulation
  - ▶ Like most policy, this is whack-a-mole work
  - ▶ Google “transfer pricing jobs”

## Intangible asset location

- ▶ Intangible assets — like patents — can be located anywhere
- ▶ Locate intangible asset in low-tax country
- ▶ Use the intangible asset to produce where it is best to produce
  - ▶ This might be a high-tax country
- ▶ Pay the royalty to the intangible asset in the low-tax country
- ▶ This strategy shifts the patent income to the low-tax country
- ▶ Particularly important for “high-tech” companies
- ▶ Example: Part of Apple’s Irish subsidiaries are owned by Baldwin Holdings Unlimited, located in the British Virgin Islands, where taxes rates are zero

## Aggregate evidence (Lipsey, 2010)

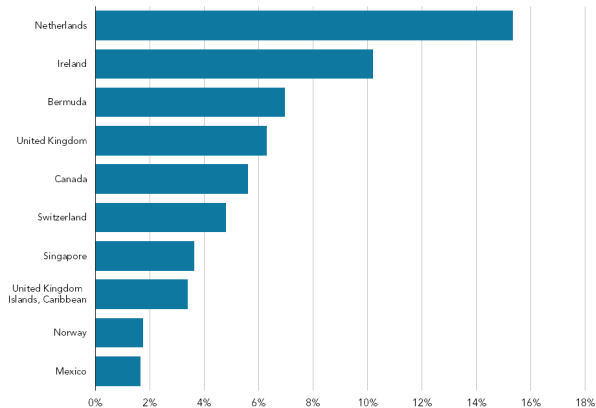
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	Ratio of U.S. foreign affiliate total assets to		
	PPE	Compensation	Employment (mil. \$ employee)
World	12	27	1.0
Canada	5	16	0.6
Ireland	29	82	4.2
Netherlands	38	73	4.5
Switzerland	49	56	4.7
Barbados	81	739	22.2
Bermuda	100	1,863	145.8
British Islands	23	686	29.4
Hong Kong	31	42	1.5
Singapore	14	37	1.3



FIGURE 1

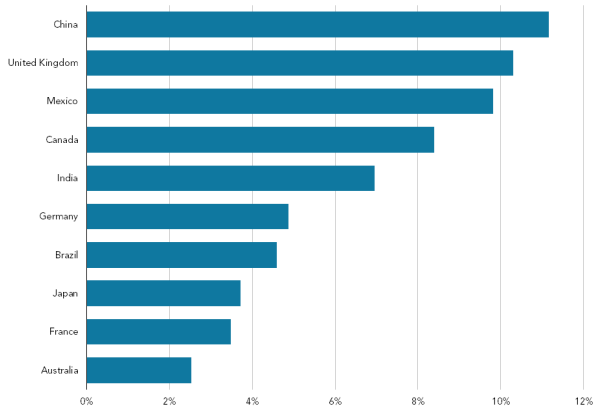
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Source: Bureau of Economic Analysis, 2014.

FIGURE 2

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Source: Bureau of Economic Analysis, 2014.

## Inversion

- ▶ Change the residence of the corporation
- ▶ 1992 McDermott Inc “moves to Panama”
  - ▶ No longer pays US tax on profits earned outside of US
  - ▶ Still pays tax on US earnings
- ▶ Sets off wave of inversions
- ▶ 2004 law bans inversions, but allows for mergers. . .
- ▶ 2015 US Pfizer (\$200 bil. market cap) to merge with Irish Allergan (\$80 bil. market cap)
  - ▶ Structured so that Allergan buys Pfizer
  - ▶ Would create an Irish company, lower tax burden
  - ▶ 2016 change in tax law scraps the deal

## The double Irish

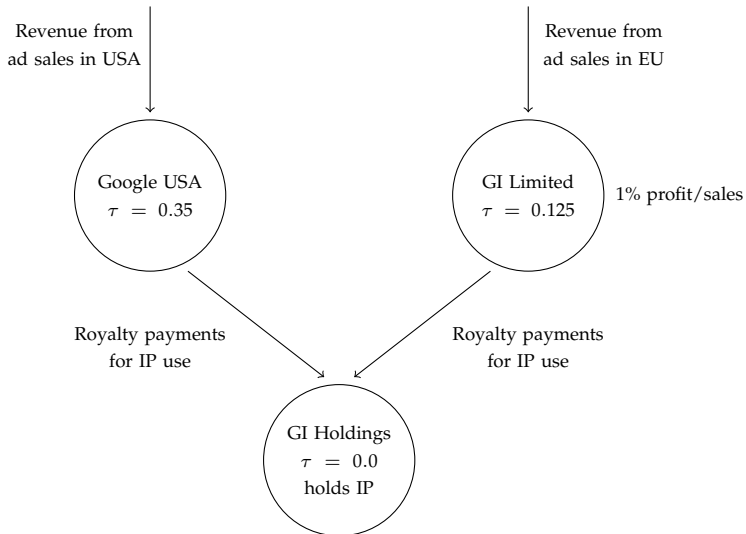
- ▶ Strategy used by several intellectual-property heavy firms to avoid taxes on foreign sales (Apple, Google, Microsoft...)
- ▶ Relies on the way Ireland taxes companies based on headquarters location
  - ▶ If Irish-incorporated firm is controlled from another country, it pays the tax in the controlling country
  - ▶ Create an Irish company controlled from a tax-free country (Bahamas, Bermuda...)
  - ▶ Route the profits earned in higher tax countries to this Bermuda-based subsidiary

## Google's double Irish

- ▶ Set up two Irish companies (incorporated in Ireland)
  - ▶ Google Ireland Limited: incorporated and controlled in Ireland
  - ▶ Google Ireland Holdings: incorporated in Ireland, controlled from an office in Bermuda
- ▶ GI Limited pays (low) Irish tax rate of 12.5% on profits
- ▶ GI Holdings pays Bermuda tax rate of 0% on profits
- ▶ Sell/license Google's intellectual property to GI Holdings in Bermuda
- ▶ Sell adds in EU through GI Limited, pay GI Holdings for use of IP

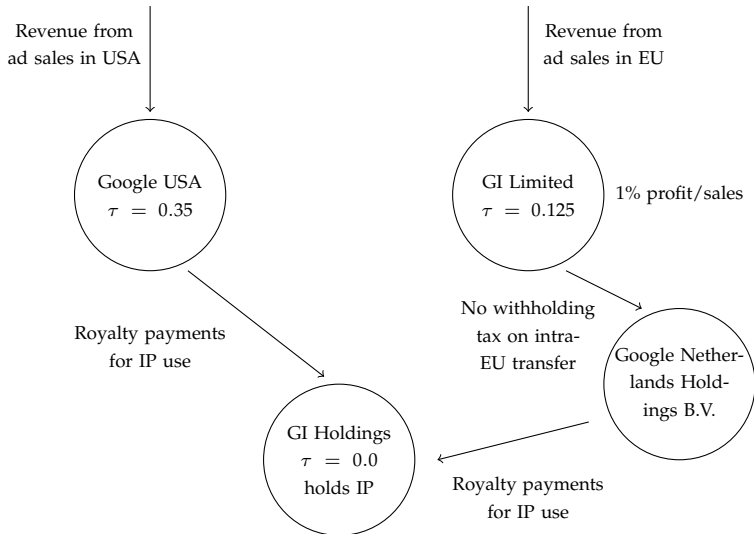
## Google's double Irish

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## ... and a Dutch sandwich

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## Summary

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- ▶ Tax policy also shapes the structure of MNEs
- ▶ MNE responses to tax policy include
  1. Do not repatriate foreign profit
    - ▶ Wait for repatriation tax holiday
  2. Earn profit in low-tax countries
    - ▶ Transfer pricing
    - ▶ Intangible asset location
    - ▶ Inversions
- ▶ MNE production location  $\neq$  MNE profit location