14.54 International Trade
— Lecture 25: Offshoring —
Do Old Rules Still Apply?

Today's Plan

1. A Simple Theory of Offshoring
2. Consequences of Offshoring
3. Final Review
4. Course Evaluations

The International Division of Labor: Yesterday

- Adam Smith's (1776) pin factory:
  "One man draws out the wire, another straights it, a third cuts it, a fourth points it, a fifth grinds it at the top for receiving the head; to make the head requires two or three distinct operations; to put it on is a peculiar business; to whiten the pins is another; it is even a trade by itself to put them into the paper; and the important business of making a pin is, in this manner, divided into about 18 distinct operations"
- International Division of Labor in XIXth, XXth century:
  - Specialization implies geographic concentration
  - Factories produce goods, which are shipped to final consumers
  - If consumers are in a different country, there is international trade

The International Division of Labor: Today

- International Division of Labor in XXIst century:
  - Revolutionary progress in communication and information technologies have lead to breakup of the production process
  - Countries still produce some goods from start to finish
  - But they increasingly participate in global supply chains in which the many tasks required to manufacture complex industrial goods are performed in several, disparate locations
- *Offshoring* $\equiv$ Phenomenon by which tasks formerly undertaken in one country are now performed abroad
  - This is associated with vertical FDI in last class' terminology
  - Offshoring is also referred to as "outsourcing" in popular discussions

The Making of an "American" Car

- Annual report of the World Trade Organization in 1998 describes the production of a particular "American" car:
  1. 30% of the car's value goes to Korea for assembly
  2. 17.5% percent goes to Japan for components and advanced technology
  3. 7.5% to Germany for design
  4. 4% to Taiwan and Singapore for minor parts
  5. 2.5% to the United Kingdom for advertising and marketing services
  6. 1.5 % to Ireland and Barbados for data processing
- Only 37% of the production value is generated in the United States!

The Making of a Barbie Doll by Mattel

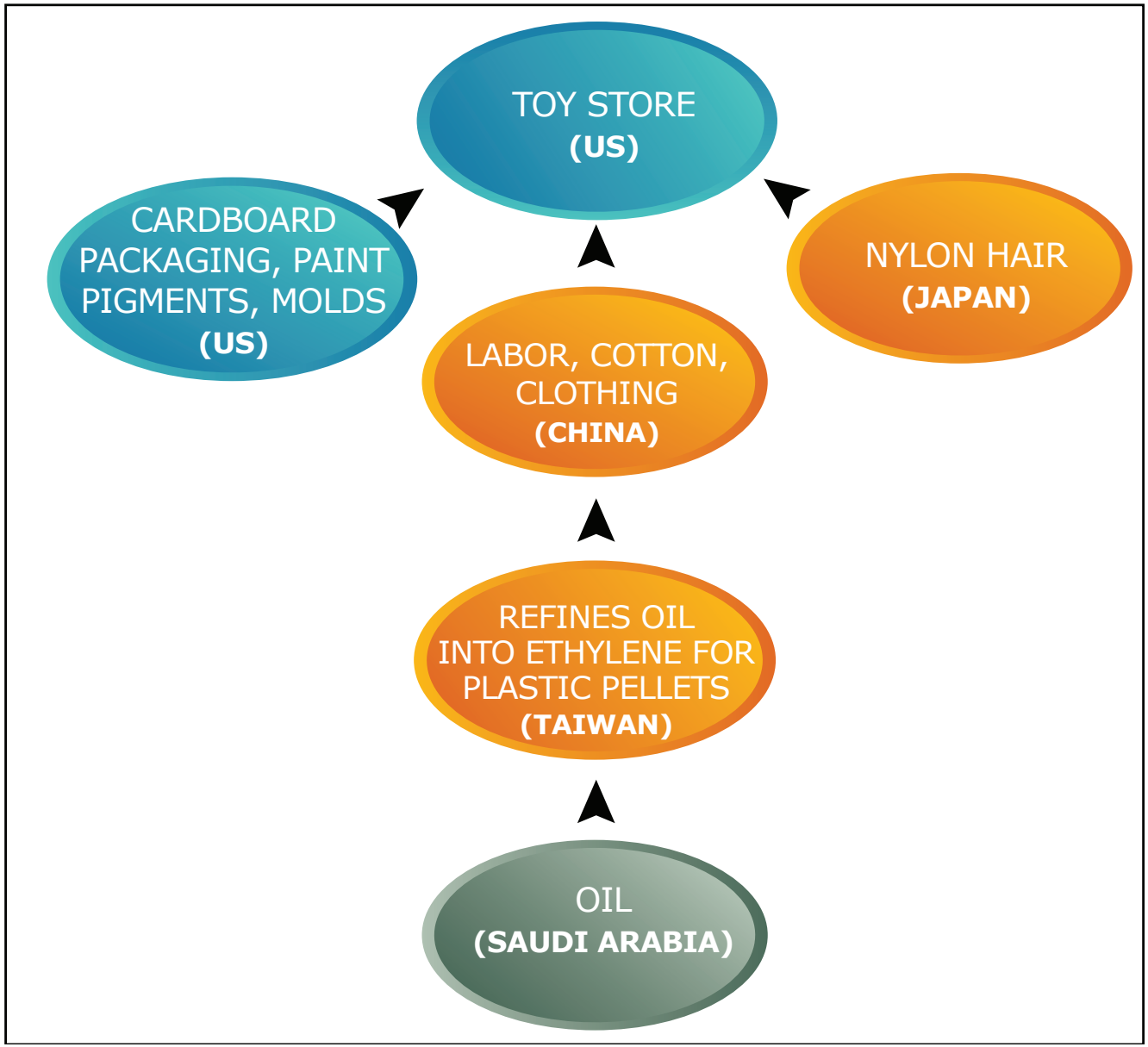


Image by MIT OpenCourseWare.

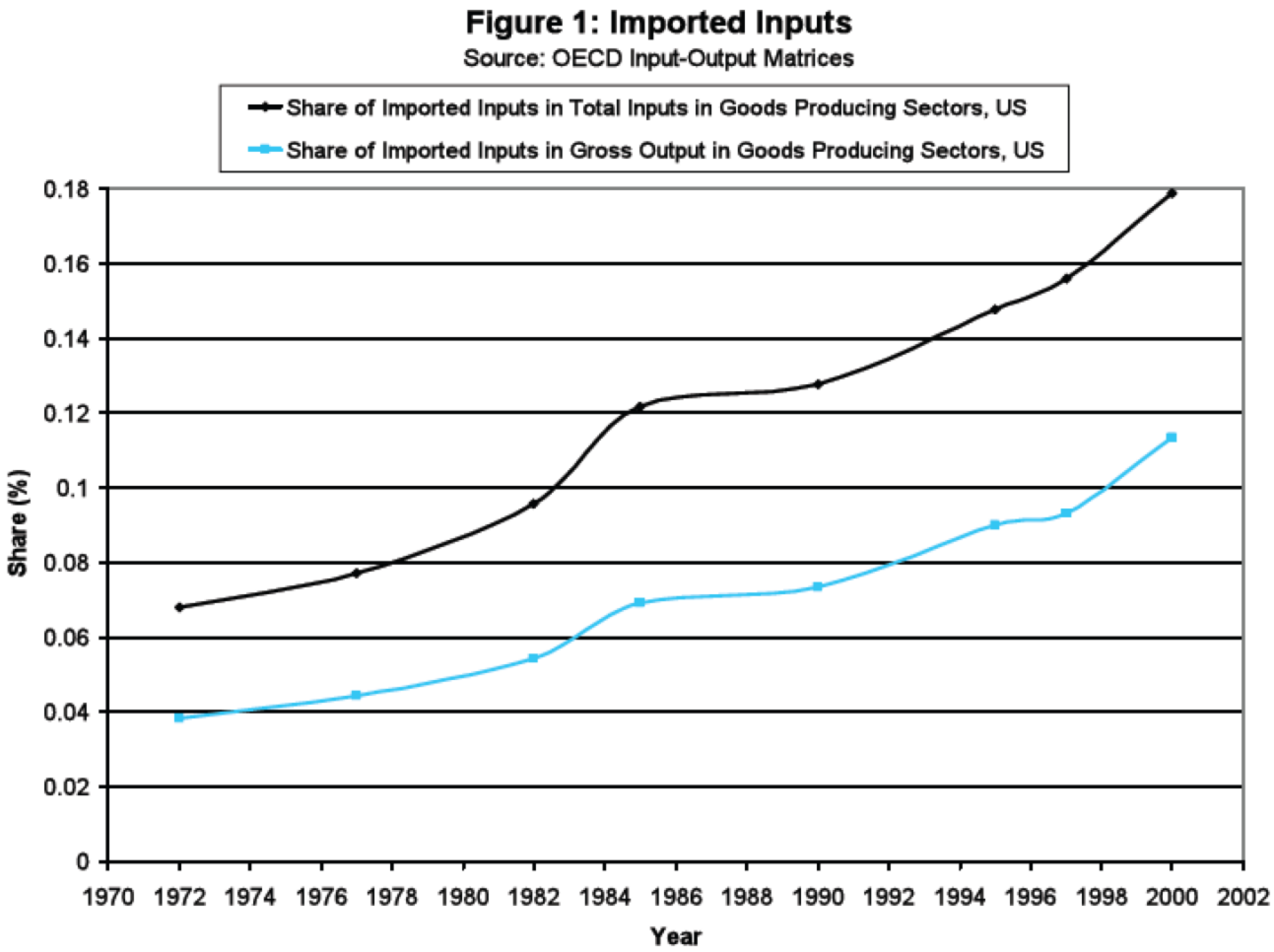
Who Makes the Apple Ipod?

Table 1. The Most Expensive Inputs in the 30GB Video iPod, 2005

Component	Supplier	Company HQ Location	Estimated Factory Price	Price as % of total factory cost	Gross Profit Rate	Est'd Value Capture
Hard Drive	Toshiba	Japan	$73.39	50%	26.5%	$19.45
Display Module	Toshiba-Matsushita	Japan	$23.27	16%	28.7%	$6.68
Video/Multimedia Processor	Broadcom	US	$8.36	6%	52.5%	$4.39
Controller	PortalPlayer	US	$4.94	3%	44.8%	$2.21
Insertion, test, and assembly	Inventec	Taiwan	$3.86	2%	N.A.**	$3.86
Battery Pack	Unknown	Japan*	$2.89	2%	30%*	$0.87
Mobile SDRAM Memory - 32 MB	Samsung	Korea	$2.37	2%	28.2%	$0.67
Back Enclosure	Unknown	Taiwan*	$2.30	2%	30%*	$0.69
Mainboard PCB	Unknown	Taiwan*	$1.90	1%	30%*	$0.57
Mobile RAM - 8 MBytes	Elpida	Japan	$1.85	1%	24.0%	$0.46
Subtotal for 10 most expensive Inputs			**$125.13**	**85%**		**$39.85**
All other inputs			$19.28	15%		
Total all iPod inputs			$144.40	100%		

Source: Portelligent, Inc., 2006 and authors' calculations
* Supposition based on other iPod models or Apple products
** See text for explanation of how Inventec's gross margin is calculated

Econometric Evidence (I): Trade in Goods

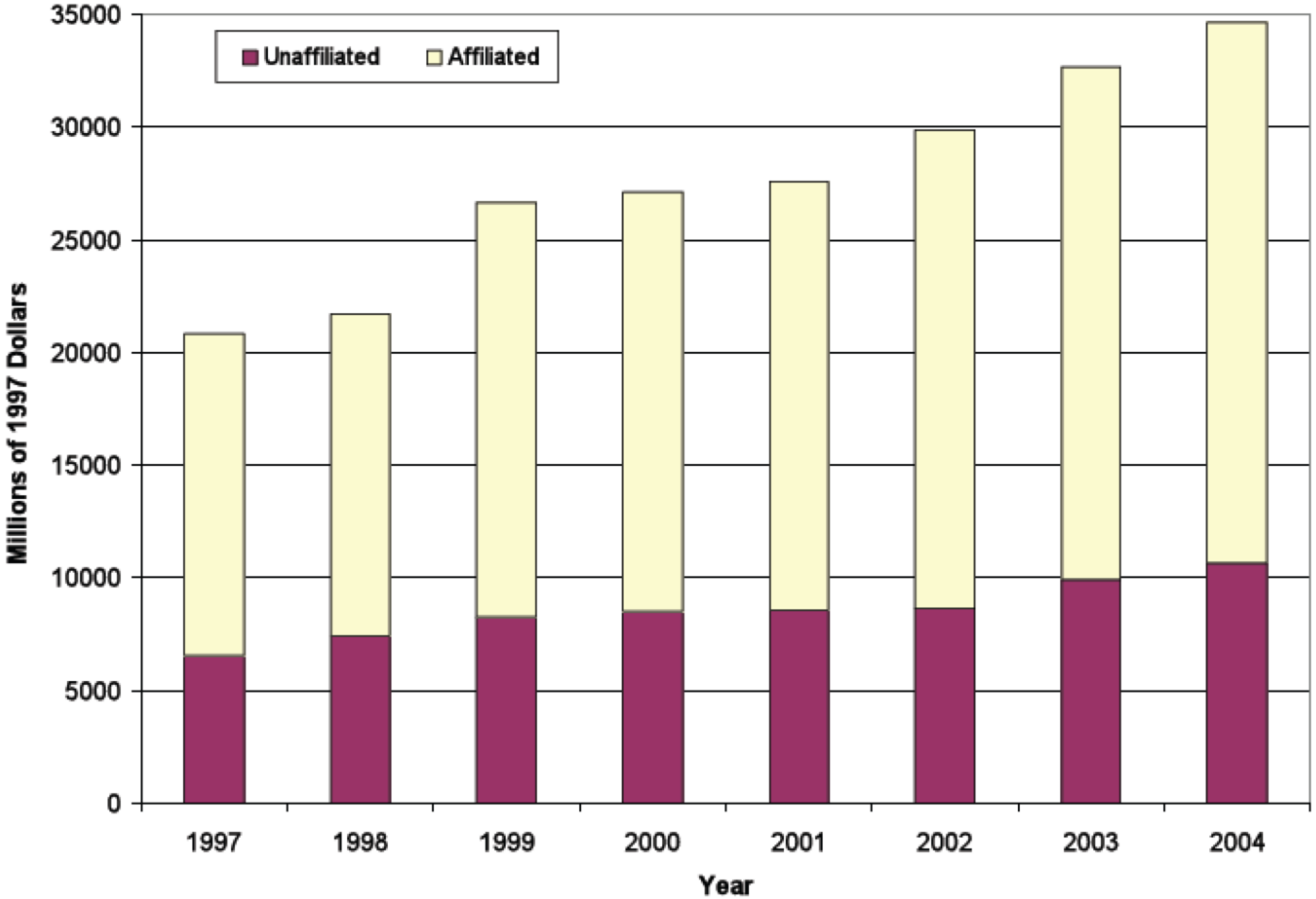


Courtesy of Gene M. Grossman and Esteban Rossi-Hansberg. Used with permission.

Econometric Evidence (II): Trade in Services

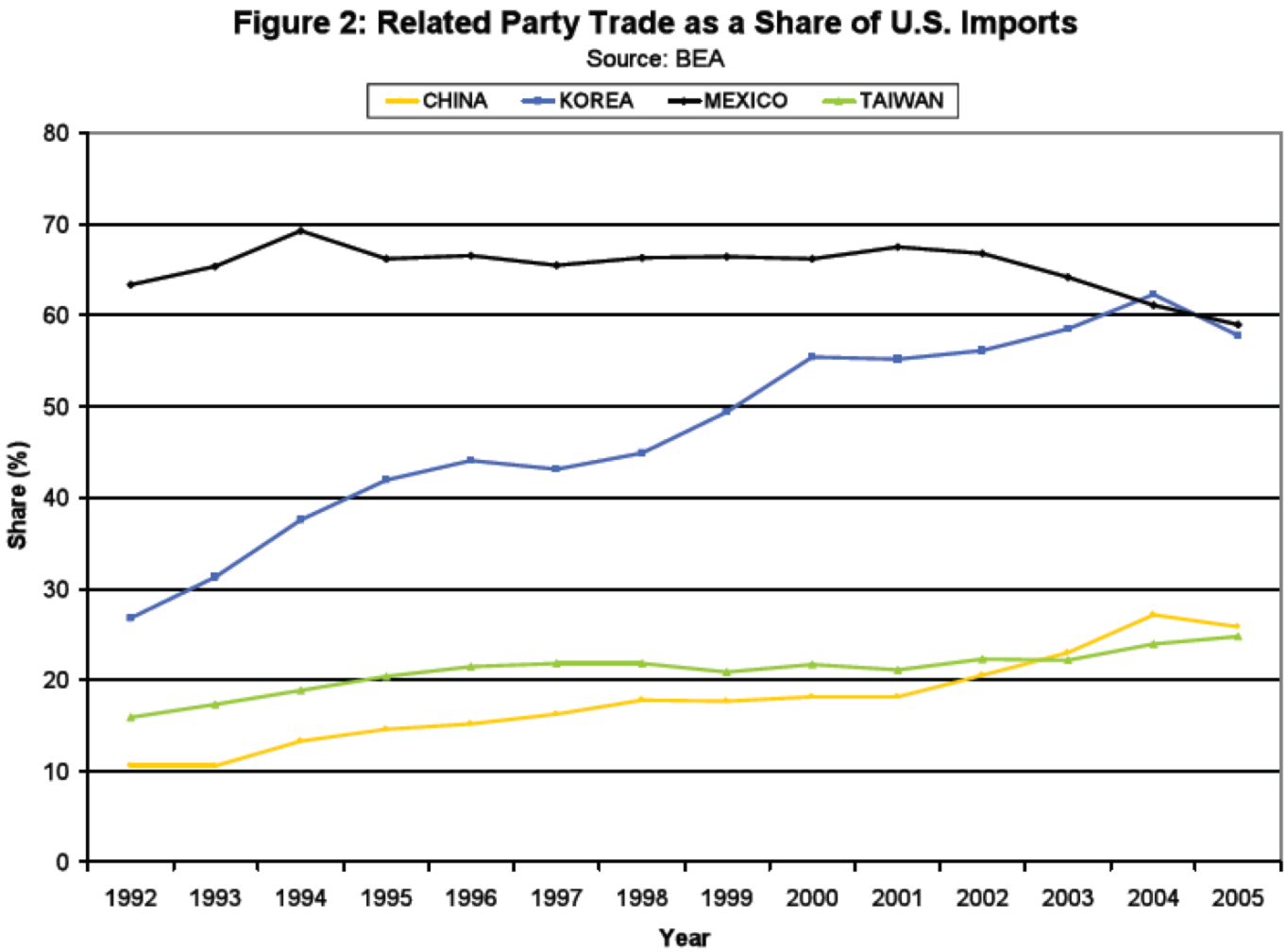
Figure 3: Total Imports of Business, Professional, and Technical Services

Source: BEA



Courtesy of Gene M. Grossman and Esteban Rossi-Hansberg. Used with permission.

Econometric Evidence (III): Multinational Activities



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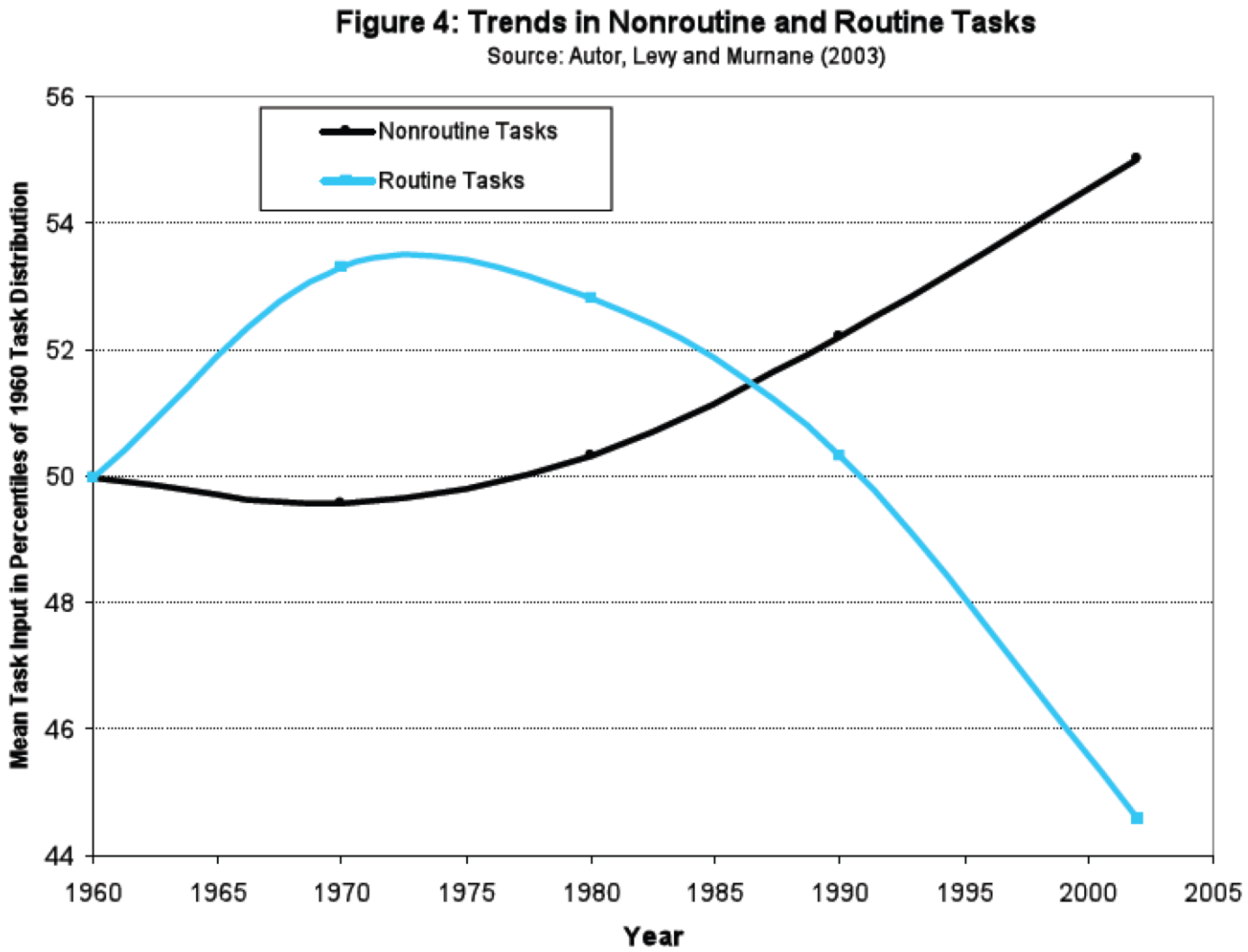
Econometric Evidence (IV): Labor Market



Courtesy of Gene M. Grossman and Esteban Rossi-Hansberg. Used with permission.

Questions

- What are the consequences of "Globalization" when trade involves trade in *tasks* rather than trade in *final goods*?
- Who are the winners and losers of offshoring?

1. A Simple Theory of Offshoring

Main Assumptions

- We consider a model developed by Grossman and Rossi-Hansberg
- As in Heckscher-Ohlin model:
  - There are two countries, Home and Foreign
  - There are 2 tradeable goods, C and F
  - There are two factors of production, L and H
- In contrast with Heckscher-Ohlin model:
  - Production process involves a large number of *tasks* $i \in [0, 1]$
- Tasks are of two types:
  - L-tasks which require 1 units of low-skilled labor
  - H-tasks which require 1 units high-skilled labor

Offshoring Costs

- Tasks vary in their offshoring costs
  - because some tasks are easier to codify
  - because some services must be delivered personally, while others can be performed at a distance with little loss in quality
- To capture this idea, we assume that:
  - H-tasks cannot be offshored
  - L-tasks can be offshored, but amount of low-skilled labor necessary to perform task i abroad is given by $\beta t(i) > 1$
- Under this assumption,
  - β reflects overall feasibility of offshoring at a point in time (e.g. communication technology)
  - $t(i)$ is an increasing function which captures differences in offshoring costs across tasks (e.g. cleaning room vs. call center)

The Offshoring Decision

- Suppose that wages for low-skilled labor are higher at Home

$$w > w^*$$

- Benefit of offshoring$\equiv$ lower wages abroad
- Cost of offshoring$\equiv$ loss in productivity captured by $\beta t(i)$
- In a competitive equilibrium, firm will offshore tasks if and only if:

$$\beta t(i) w^* < w$$

- Let $I \in [0, 1]$ denote the marginal task that is being offshored

$$\beta t(I) w^* = w \tag{1}$$

2. Consequences of Offshoring

Offshoring as Factor Augmenting Technological Change

- The cost of producing one unit of some good is given by

$$c = a_L \left[w(1-I) + w^* \beta T(I) \right] + a_H s \tag{2}$$

  with $T(I) \equiv \int_0^I t(i)di$, $s \equiv$ wage of high-skilled workers at Home
- Substituting (1) into (2), we obtain

$$c = a_L w \Omega + a_H s$$

  where $\Omega = (1-I) + \frac{T(I)}{t(I)} < 1$
- This looks just like the cost equation of a firm that employs low-skilled workers whose productivity is (inversely) measured by Ω
  - Hence, offshoring is economically equivalent to labor-augmenting technological progress

Consequences of a Reduction in Offshoring Costs

- Consider a decrease in β (introduction of fax machine, email, mobile telephony, videoconferencing, etc.)
- What happens to the domestic wage of low-skilled workers?

$$\widehat{w} = -\widehat{\Omega} - \alpha_1 \widehat{p} - \alpha_2 \frac{dI}{1 - I}$$

- First term $\equiv$ *Productivity Effect*
  - Fall in Ω boosts demand for low-skilled labor and, thus, push up their wages, like factor augmenting technological change
- Second term $\equiv$ *Relative-price Effect*
  - Like Stolper-Samuelson channel in Heckscher-Ohlin model
  - α_1 depends on differences in factor intensities in the two sectors
- Third term $\equiv$ *Labor-supply Effect*
  - $dI > 0$ frees up the domestic labor that otherwise would perform these tasks, and so has effects analogous to increase in supply of this factor

Consequences of a Reduction in Offshoring Costs (Cont.)

- What happens to the domestic wage of high-skilled workers?

$$\widehat{s} = \alpha_3 \widehat{p} + \alpha_4 \frac{dl}{1-l}$$

- There is no direct productivity effect (no offshoring)
- The first term also reflects a Stolper-Samuelson like effect
  - This is beneficial for high-skilled workers if the relative price of the skill intensive good goes up
- The second term also reflects the freeing up of domestic low-skilled labor associated with offshoring
  - This is beneficial for high-skilled workers because they become relatively more scarce

Small Open Economy Special Case

- **Proposition** *If Home is a small open economy that produces both goods, a decrease in β increases w and leaves s unchanged*
- **Proof:**
  1. Zero profit requires:

$$p_i = a_{Li} w\Omega + a_{Hi} s,\ i = 1, 2$$

  2. Since Home a small open economy, p_i does not depend on β
  3. This implies that $w\Omega$ and s do not depend on β either
  4. Since Ω is decreasing in β, we get w increasing in β

Small Open Economy Special Case (Cont.)

- By assumption, there are no changes in world prices: $\widehat{p} = 0$
- With two goods and two factors, changes in factor supplies do not affect factor prices, as long as both industries are active: $\alpha_2 = \alpha_4 = 0$
  - An increase in the supply of low-skilled labor leads to an expansion of the labor-intensive sector and a contraction of the skill-intensive sector (Rybczynski effect)
- As a result, a reduction in offshoring costs implies

$$\begin{aligned} \widehat{w} &= -\widehat{\Omega} > 0 \\ \widehat{s} &= 0 \end{aligned}$$

Low-skilled workers whose "jobs" are being offshored are better off!

3. Final Review

Topics Covered

- *All* Lecture notes 1-25:
  - Basic facts about globalization
  - Endowment trade model
  - Standard trade model
  - Ricardian trade model
  - Specific factor model
  - Heckscher-Ohlin model
  - Increasing returns to scale
  - Trade policy
  - Factor mobility
  - Offshoring
- Textbook:
  - Chapters 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12
- Additional materials from the reading list are covered only if mentioned in class

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Fall 2016