

## TRADE WITH SCALE ECONOMIES AND IMPERFECT COMPETITION

### EXAMPLES TO ILLUSTRATE SOME BASIC ISSUES

[1] Scale economies yield gains from trade even between identical countries.

Two goods with production functions

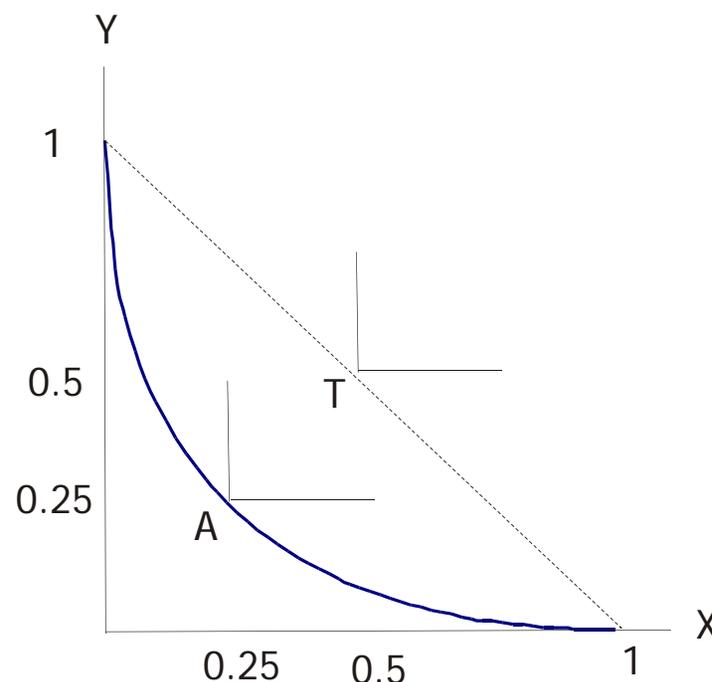
$$X = (L_X)^2, \quad Y = (L_Y)^2$$

$$\text{PPF } L = L_X + L_Y = X^{1/2} + Y^{1/2}$$

1-to-1 Leontief preferences

In autarky, each country at A

But with trade, efficient to specialize and share; each consumes at T.



But: this may not be achievable using markets; details to follow.

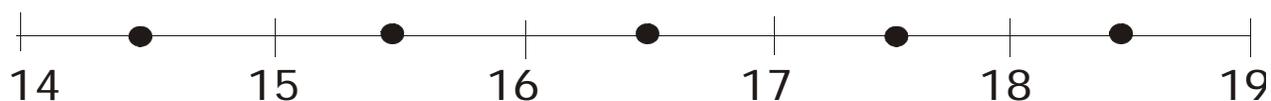
Another implication: pattern of specialization and trade can be arbitrary, governed by historical accident or some other consideration.

[2] Product differentiation with moderate scale economies:

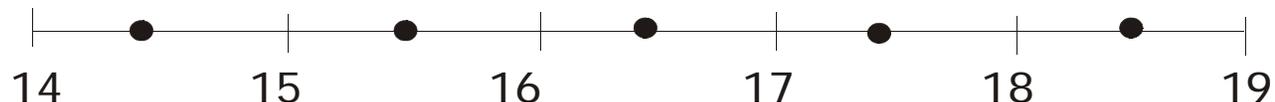
Firms serve market segments & compete with others in neighboring segments.

Illustrative example:

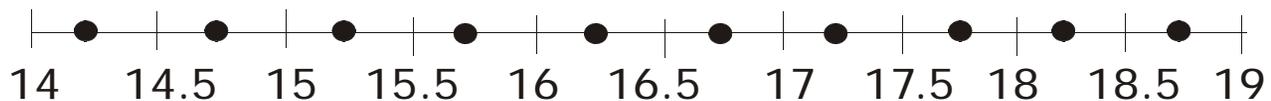
Autarky: Market size 1 million per inch of shirt collar size  
5 firms (dots), each serving 1 million (1-inch segment)



Trade: Market size 2 million per inch. Extreme possibility 1  
5 firms (dots), each serving 2 million. Lower average costs

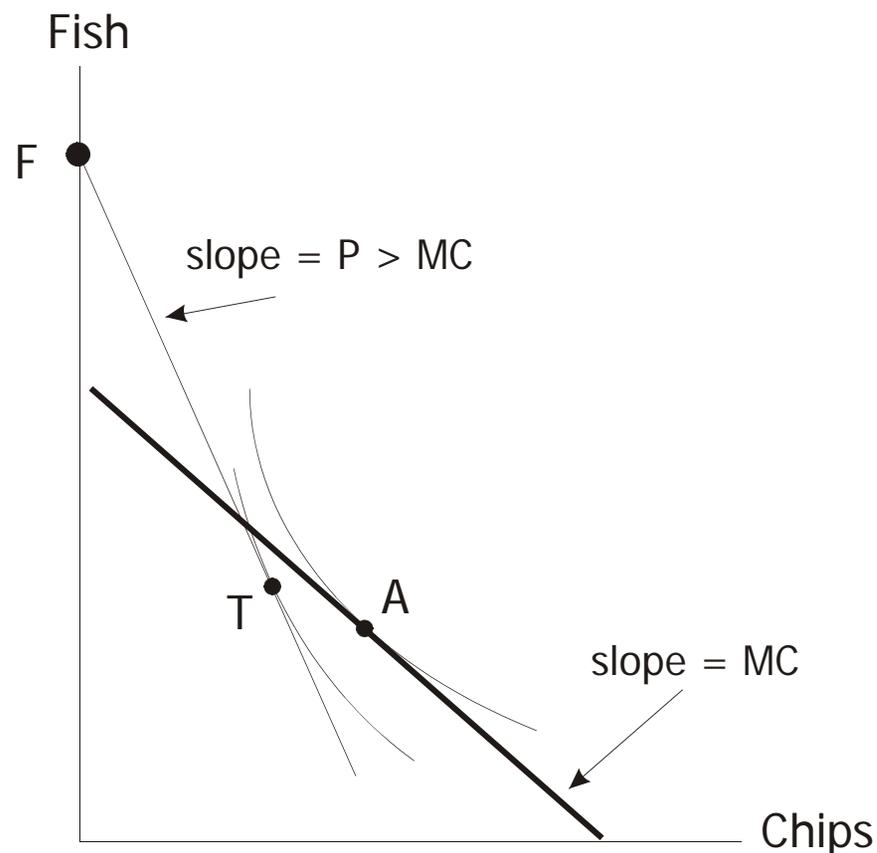


Trade: Market size 2 million per inch. Extreme possibility 2  
10 firms (dots), each serving 1 million  
Greater variety. More competition, P closer to MC.



Reality is between the two extremes; so three sources of utility gain

[3] Possibility of loss from trade:  
 Two goods, Fish and (Micro)Chips  
 Fish has constant returns to scale  
 Chips have large fixed cost, and  
 constant marginal cost  
 PPF as shown: isolated point F  
 and thick straight line  
 If economy can be managed  
 efficiently in autarky, at A  
 But if the country irreversibly  
 chooses to specialize in Fish,  
 foreign suppliers of Chips have  
 monopoly power ( $P > MC$ ),  
 Country's budget line from F  
 is steeper than PPF



May consume at T, worse than A, perhaps even inside its own PPF  
 This is an extreme example, but some effects of this kind may arise.

If this situation exists, countries may want to grab the industries with  
 scale economies, monopoly power and the associated excess profits.  
 But if both try this, they may play a prisoners' dilemma game and both lose.

## TYPES OF ECONOMIES OF SCALE

### Internal:

Each firm's average cost curve downward-sloping as its own output increases

Market structure must be imperfectly competitive,

oligopoly if only a few (2-3) firms survive: aircraft

monopolistic competition if several (10 or more) survive, free entry: autos

In principle, scale economies are an added reason to gain from trade:

Even identical countries can benefit by specializing to

[1] lower average costs, [2] consumers everywhere get more variety,

[3] larger market lowers monopoly power, so prices closer to marginal costs

But these gains may not materialize because of market imperfection;

possible role for beneficial trade policy, but also policy conflict among countries

### External:

Each firm's average cost curve shifts down as industry output increases

Market can be perfectly competitive but equilibrium is not optimal

So again role for policy to counter market distortions

## MONOPOLISTIC COMPETITION

Total market size (no. of consumers buying 1 unit each) =  $S$

Each firm's total cost  $F + m q$ , where  $q$  is quantity of firm's output  
 $n$  identical firms; number to be determined from entry condition

Symmetric equilibrium; each firm charges price  $P^*$

One firm's demand curve if it deviates to charge a different price  $P$ :

$$q = S \left[ \frac{1}{n} - b (P - P^*) \right]$$

Can be justified using mathematical formulation of shirt-collar example

Each firm's inverse demand curve  $P = P^* + (1/nb) - q/(Sb)$

$$\text{Marginal revenue} = P^* + (1/nb) - 2q/(Sb)$$

Each firm takes  $P^*$  and  $n$  as given, therefore its profit maximization yields

$$P^* + (1/nb) - 2q/(Sb) = m$$

When each firm charges  $P^*$ , each sells  $q = S/n$ ; then  $P^* = m + (1/nb)$

Firms enter or exit so in equilibrium zero pure profit:  $P^* = m + F/q = m + n F/S$

$$\text{Solution: } n = (S/bF)^{1/2}; \text{ then } P^* = m + (F/Sb)^{1/2}, q = (bFS)^{1/2}$$

Effects of changes in parameters are intuitive:

Larger  $b$  (different firms' outputs better substitutes)

Fewer and larger firms, price of each closer to marginal cost

Larger fixed cost  $F$

Fewer and larger firms, price of each higher (to cover fixed cost)

Most important: Trade has the effect of putting together countries' markets

Larger market implies: [1] increase in number of firms (more product variety),

[2] increase in size of each firm (lower AC),

[3] price closer to marginal cost (less dead-weight loss).

But which country will produce which varieties of these goods?

That can depend on factor endowment or technology considerations

similar to those for comparative advantage

Suppose differentiated goods with scale economies are autos;

other good is food, with constant returns to scale

Autos relatively capital intensive (in both the fixed and marginal cost aspects)

Then capital-rich country will be NET exporter of autos, importer of food

But some cross trade (intra-industry trade) in autos

Two stylized extreme examples:

### FRANCE-GERMANY

Very similar size and factor endowment proportions; no conventional comp. adv.

Both have similar differentiated product demands for autos

Consumers in both consume all available varieties of autos

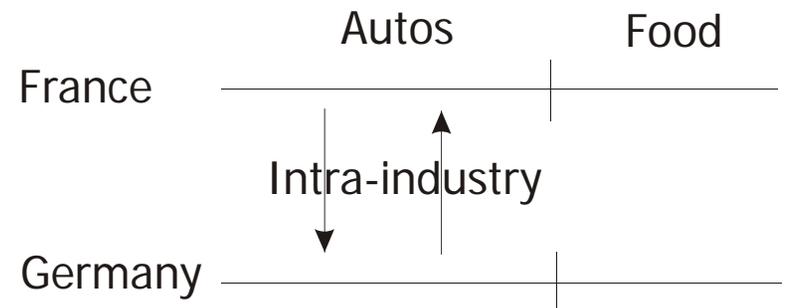
Which country produces which variety may be indeterminate

Lot of intra-industry trade; very little trade of net autos exchanged for food

Each consumes food produced at home

Trade has very little effect on factor prices so little conflict of interest

Everyone gains from intra-industry trade



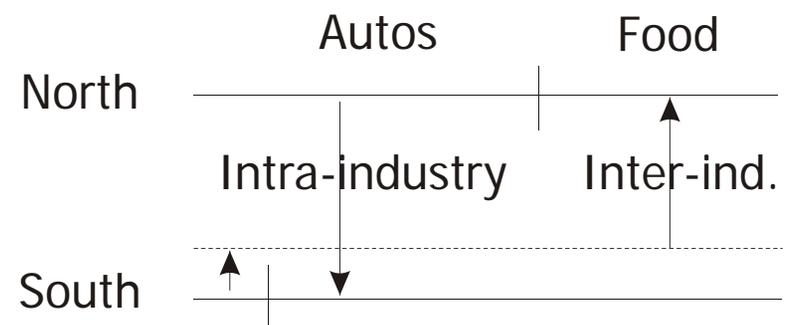
### NORTH-SOUTH

Very different factor endowment proportions

South makes very few varieties of autos

Trade mostly inter-industry: autos for food

Usual Heckscher-Ohlin, Stolper-Samuelson conflict about gains from trade



## EMPIRICAL EVIDENCE

A common measure of intra-industry trade is the Grubel-Lloyd index:

For an industry with exports  $X$  and imports  $M$ ,  $\text{index} = 1 - |X - M| / (X + M)$

Then take averages over industries, countries etc. as needed

Growth of intra-industry trade (at 3-digit level)

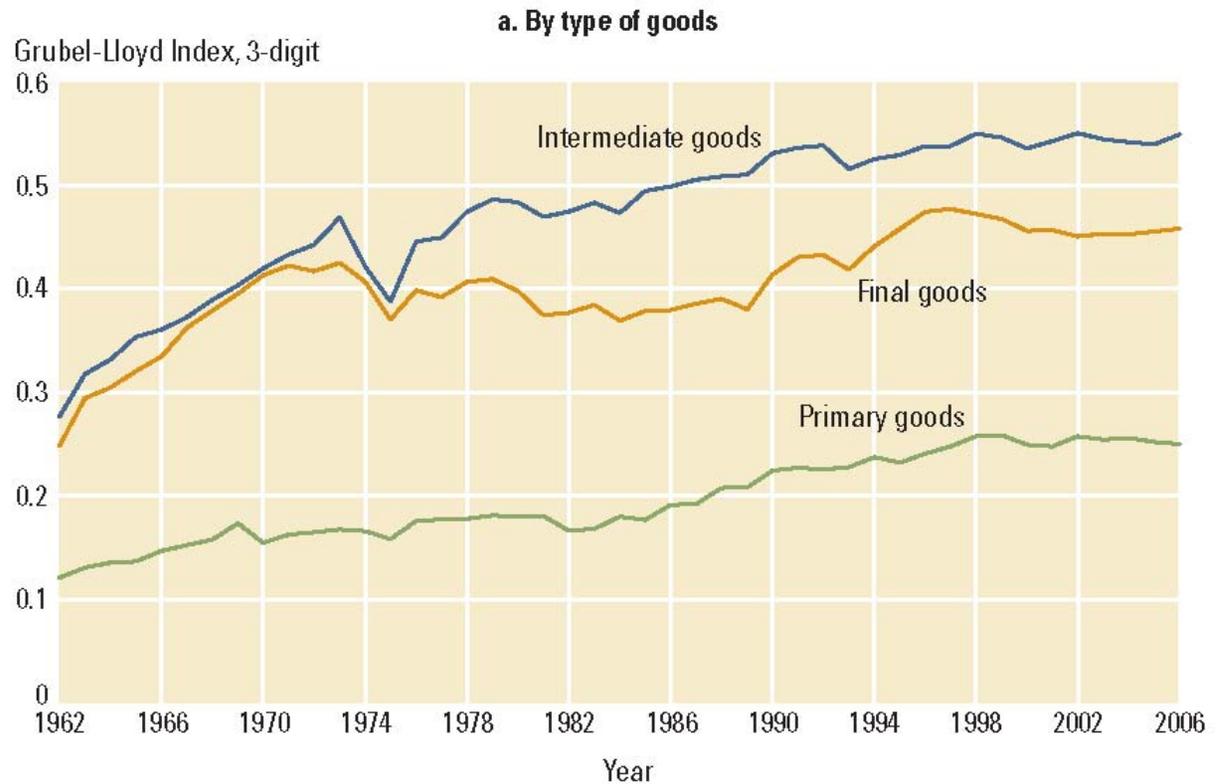
Figures from World Development Report 2009

By type of good:

Less relevant for  
primary products  
than manufactures

Intermediate goods:  
“disintegration  
of production”  
phenomenon

Leveling off: more  
North-South trade



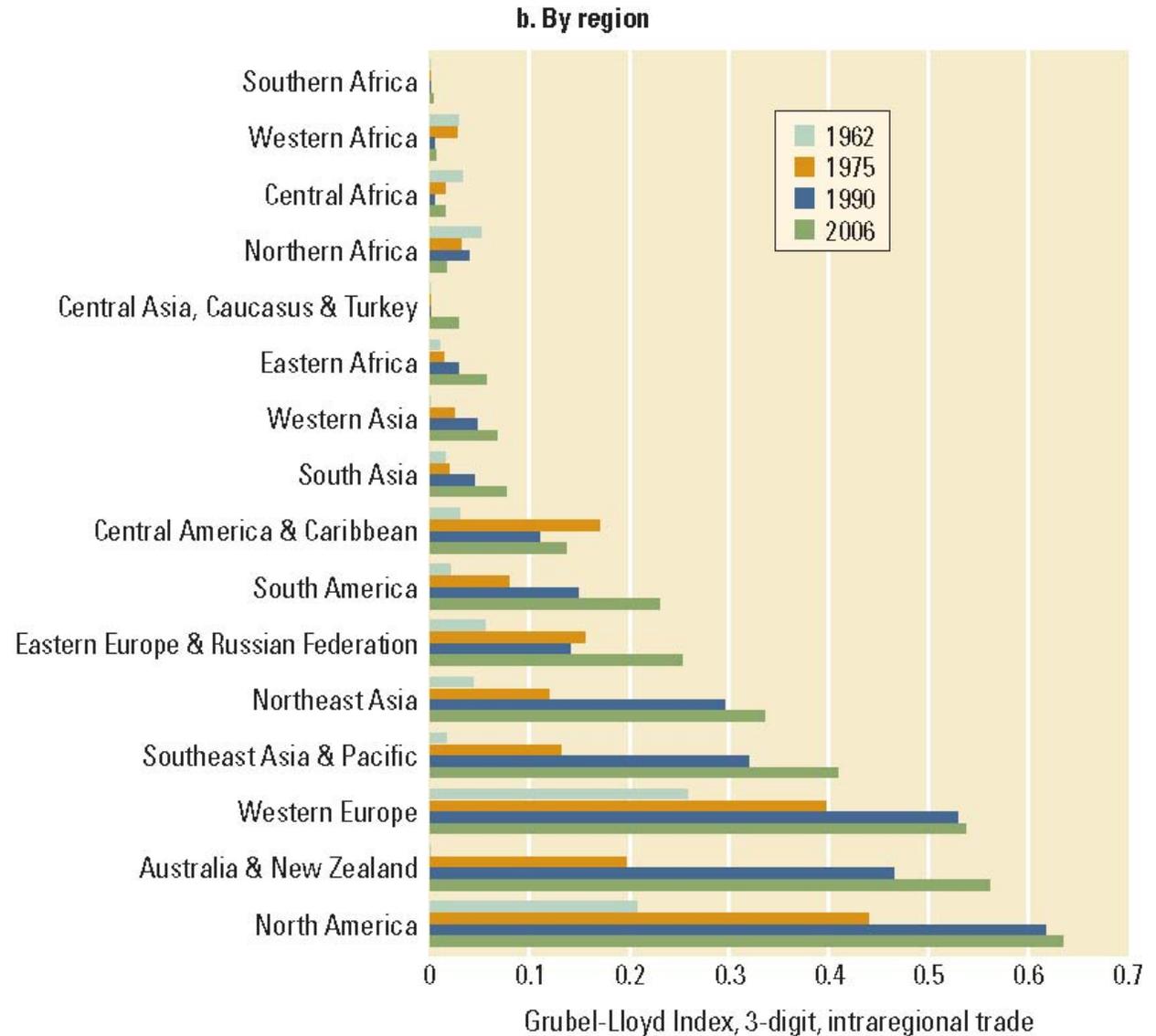
By type of country/  
region:

Very important for  
industrialized /  
advanced countries  
and regions

Less so for LDCs

But growing  
through time  
for most areas

See K-O Table 6.3  
for US intra trade  
by industry



By pairs of type of country / region

Intra-industry trade

most common between pairs of high-income countries

Consistent with model of monopolistic competition

