Public Affairs 856
Trade, Competition, and Governance
in a Global Economy
Lecture 7-9
2/8-15/2016

Instructor: Prof. Menzie Chinn
UW Madison
Spring 2017

Increasing Returns to Scale and Monopolistic Competition

6

1. Basics of Imperfect Competition

2. Trade Under Monopolistic Competition

3. The North American Free Trade Agreement

4. Intra-Industry Trade and the Gravity Equation

5. Conclusions

Introduction

Why does the U.S. export and import golf clubs to and from the same countries?

- To answer this question we introduce a new explanation for trade based on the model of **monopolistic competition** in this chapter.

- In perfectly competitive markets, the goods produced are homogeneous. In this chapter, we assume that goods are differentiated, and allow for **imperfect competition**.

Introduction

In this chapter we examine:

1. The basics of the monopolistic competition model.

2. How consumer choices and prices are affected under monopolistic competition when trade opens between two countries.

3. The gains from international trade under monopolistic competition.

4. The gains and adjustment costs for Mexico and the United States under NAFTA.

5. The **gravity equation**, which states that countries with higher GDP, or that are close, will trade more.

Introduction

- Most goods are **differentiated goods**, that is, they are not identical.

- When we allow for imperfect competition, firms can influence the price they charge.

- Monopolistic competition has two key features:

  o The goods produced by different firms are differentiated.

  o Firms enjoy **increasing returns to scale**, by which we mean that the average costs for a firm fall as more output is produced.

Introduction

- Intra-industry trade deals with imports and exports in the same industry.

- Large countries (as measured by their GDP) should trade the most. This is the prediction of the gravity equation.

- The monopolistic competition model also helps us to understand the effects of **free-trade agreements**, in which free trade occurs among a group of countries.

- Next, we will compare and contrast the cases of monopoly and **duopoly**, specifically, the demand characteristics in each type of market.

1 Basics of Imperfect Competition

Monopoly Equilibrium

The extra revenue earned from selling one more unit is called the **marginal revenue**.

FIGURE 6-1
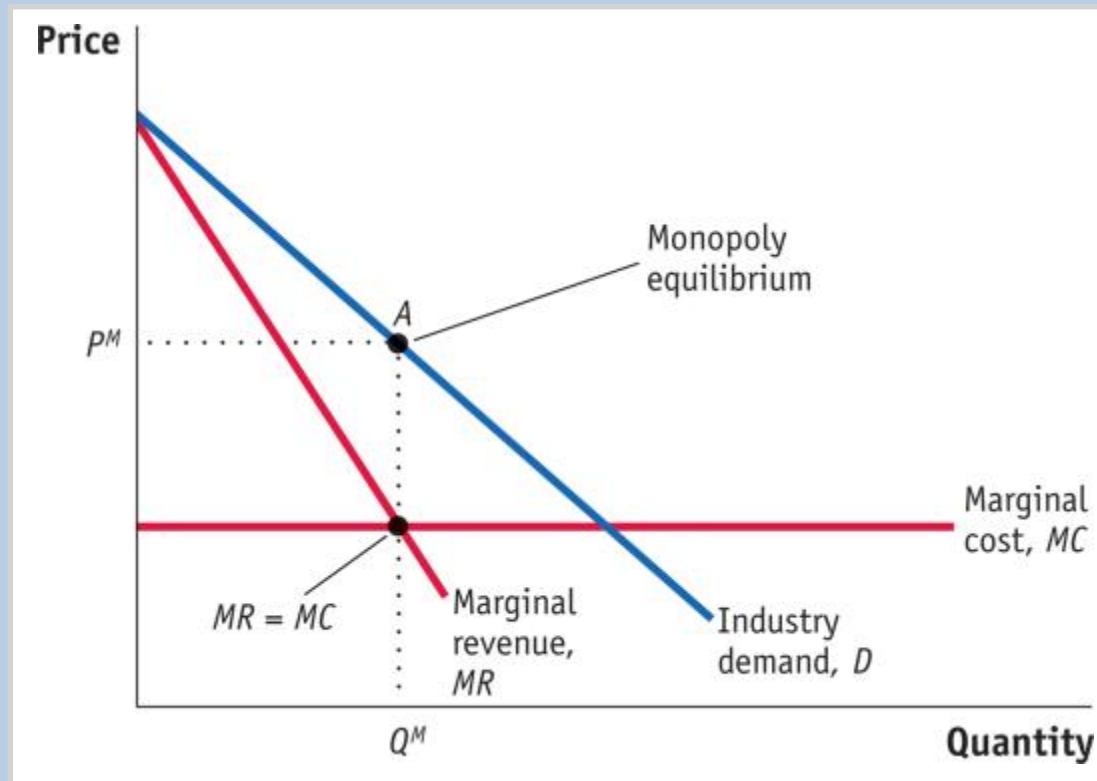
Monopoly Equilibrium

The monopolist chooses the profit-maximizing quantity, Q^M, at which marginal revenue equals **marginal cost**.

From that quantity, we trace up to the demand curve and over to the price axis to see that the monopolist charges the price P^M.
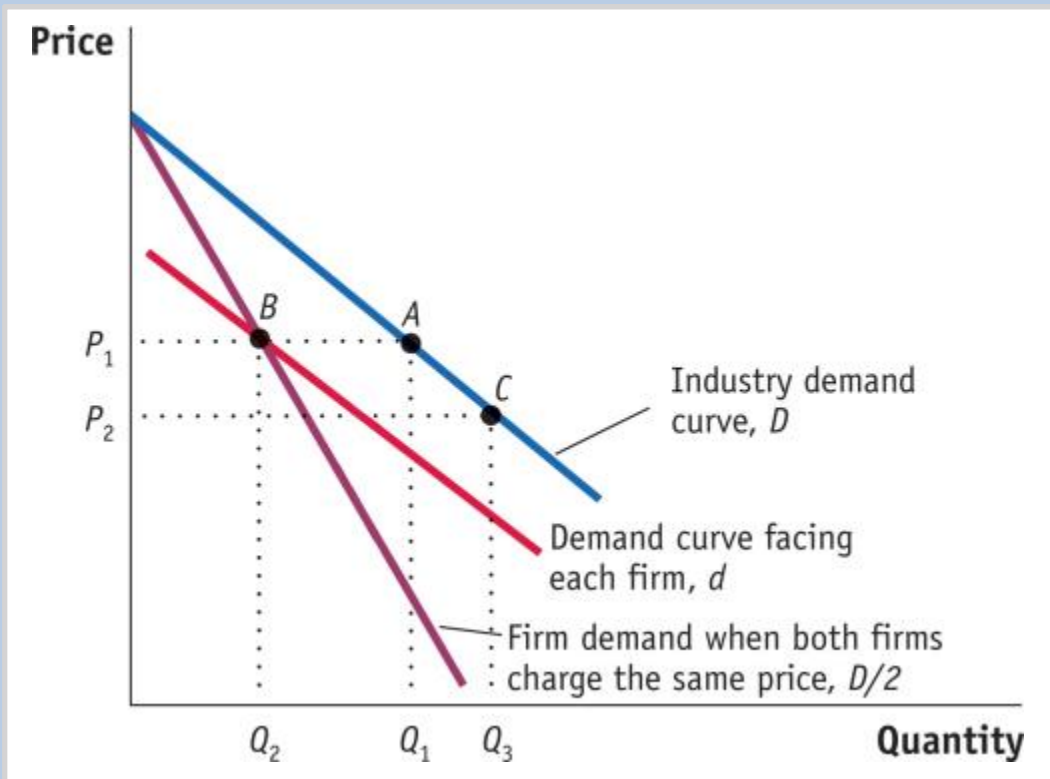
The monopoly equilibrium is at point A.

1 Basics of Imperfect Competition

Demand with Duopoly

FIGURE 6-2 (1 of 2) Demand Curves with Duopoly

When there are two firms in the market and they both charge the same price, each firm faces the demand curve $D/2$.

At the price P_1, the industry produces Q_1 at point A and each firm produces $Q_2 = Q_1/2$ at point B.

If both firms produce identical products and one firm lowers its price to P_2, all consumers will buy from that firm only; the firm that lowers its price will face the demand curve, D, and sell Q_3 at point C.
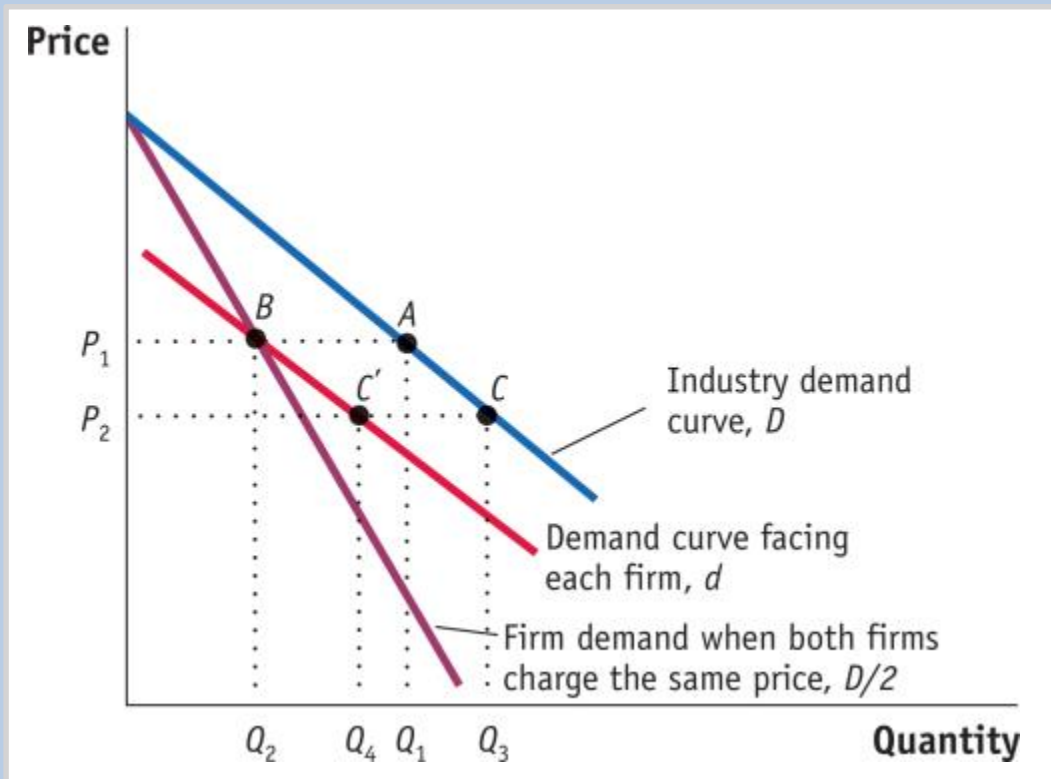
1 Basics of Imperfect Competition

Demand with Duopoly

FIGURE 6-2 (2 of 2)   Demand Curves with Duopoly (continued)

Alternatively, if the products are differentiated, the firm that lowers its price will take some, but not all, sales from the other firm; it will face the demand curve, d, and at P_2 it will sell Q_4 at point C'.

2 Trade Under Monopolistic Competition

Assumptions of the model of monopolistic competition:

Assumption 1: Each firm produces a good that is similar to but differentiated from the goods that other firms in the industry produce.

- Each firm faces a downward-sloping demand curve for its product and has some control over the price it charges.

Assumptions of the model of monopolistic competition:

Assumption 2: There are many firms in the industry.

- If the number of firms is N, then D/N is the share of demand that each firm faces when the firms are all charging the same price.

- When only one firm lowers its price, however, it will face a flatter demand curve d.

2 Trade Under Monopolistic Competition

Assumptions of the model of monopolistic competition:

Assumption 3: Firms produce using a technology with increasing returns to scale.
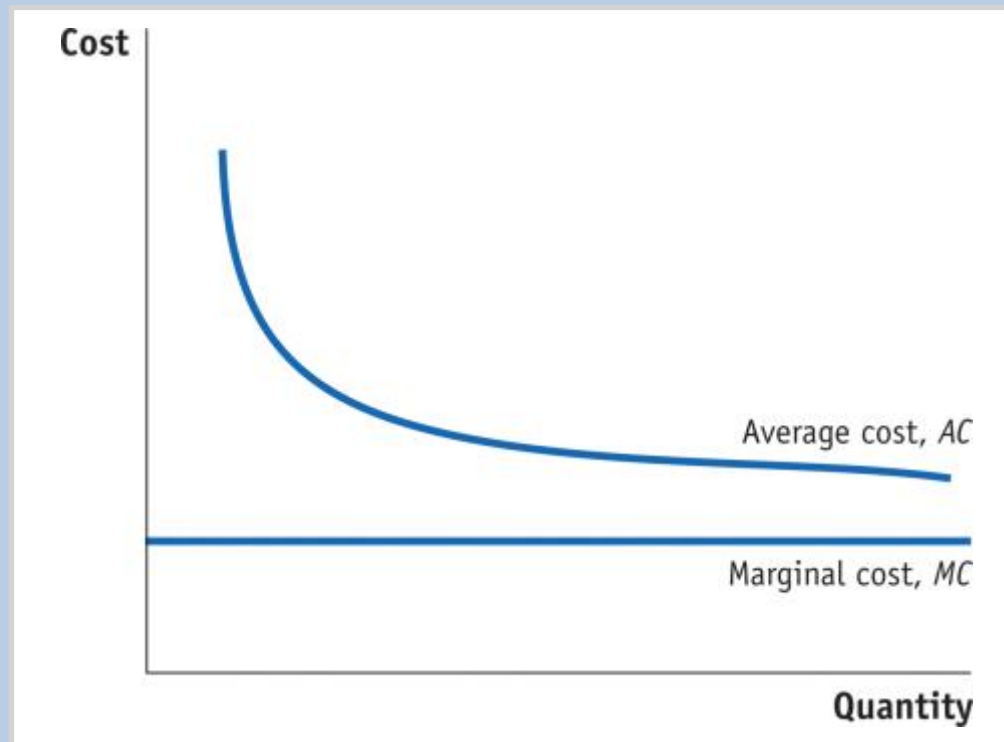
Increasing Returns to Scale This diagram shows the average cost, AC, and marginal cost, MC, of a firm.

Increasing returns to scale cause average costs to fall as the quantity produced increases.

Marginal cost is below average cost and is drawn as constant for simplicity.

2 Trade Under Monopolistic Competition

Assumptions of the model of monopolistic competition:

Assumption 4: Because firms can enter and exit the industry freely, monopoly profits are zero in the long run.

- Firms will enter as long as it is possible to make monopoly profits, and the more firms that enter, the lower profits per firm become.

- Profits for each firm end up as zero in the long run, just as in perfect competition.

Equilibrium Without Trade

Short-Run Equilibrium
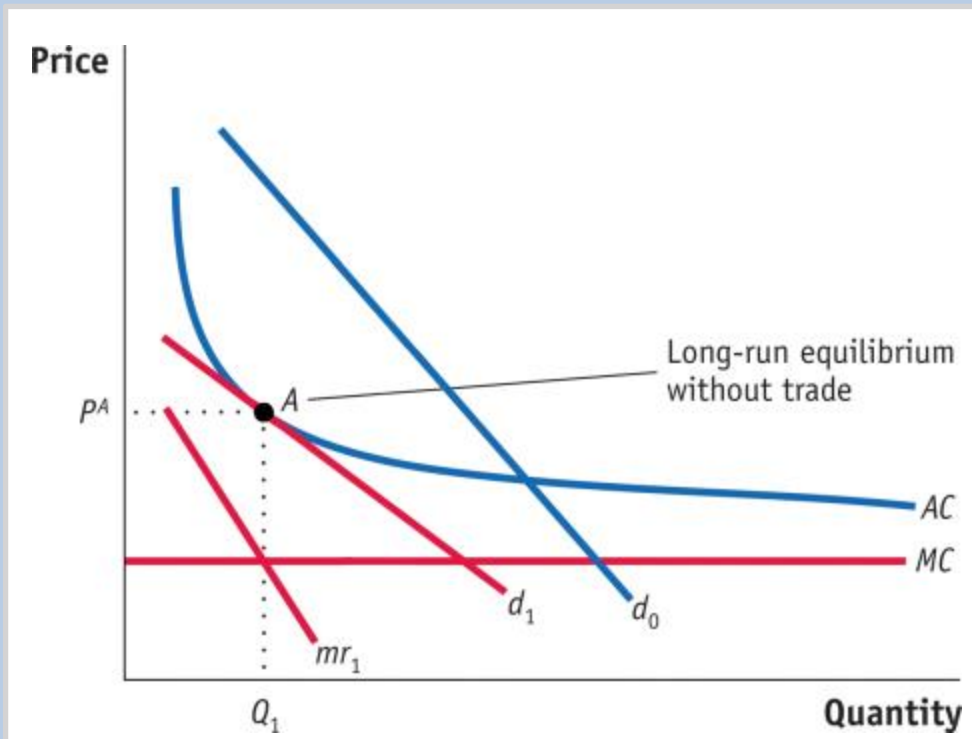
FIGURE 6-4
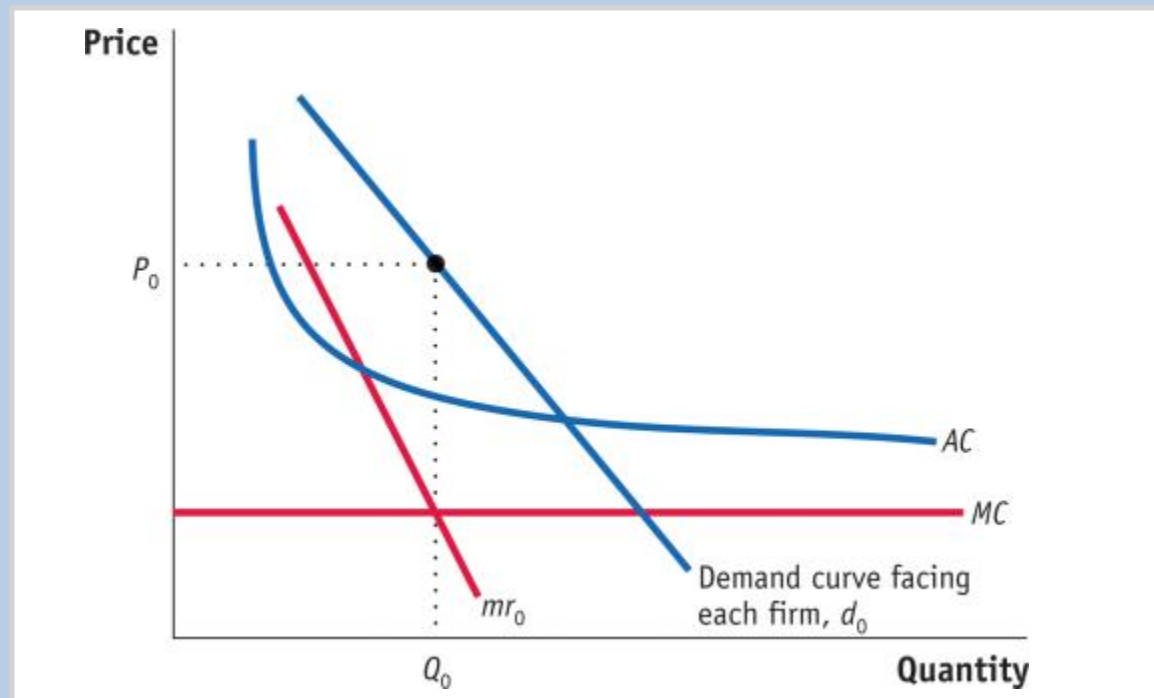
Short-Run Monopolistic Competition Equilibrium Without Trade The short-run equilibrium under monopolistic competition is the same as a monopoly equilibrium. The firm chooses to produce the quantity Q_0 at which the firm's marginal revenue, mr_0, equals its marginal cost, MC. The price charged is P_0. Because price exceeds average cost, the firm makes monopoly profits.

Equilibrium Without Trade

Long-Run Equilibrium

FIGURE 6-5 (1 of 2)   Long-Run Monopolistic Competition Equilibrium Without Trade

Drawn by the possibility of making profits in the short-run equilibrium, new firms enter the industry and the firm's demand curve, d_0, shifts to the left and becomes more elastic (i.e., flatter), shown by d_1.

The long-run equilibrium under monopolistic competition occurs at the quantity Q_1 where the marginal revenue curve, mr_1 (associated with demand curve d_1), equals marginal cost.
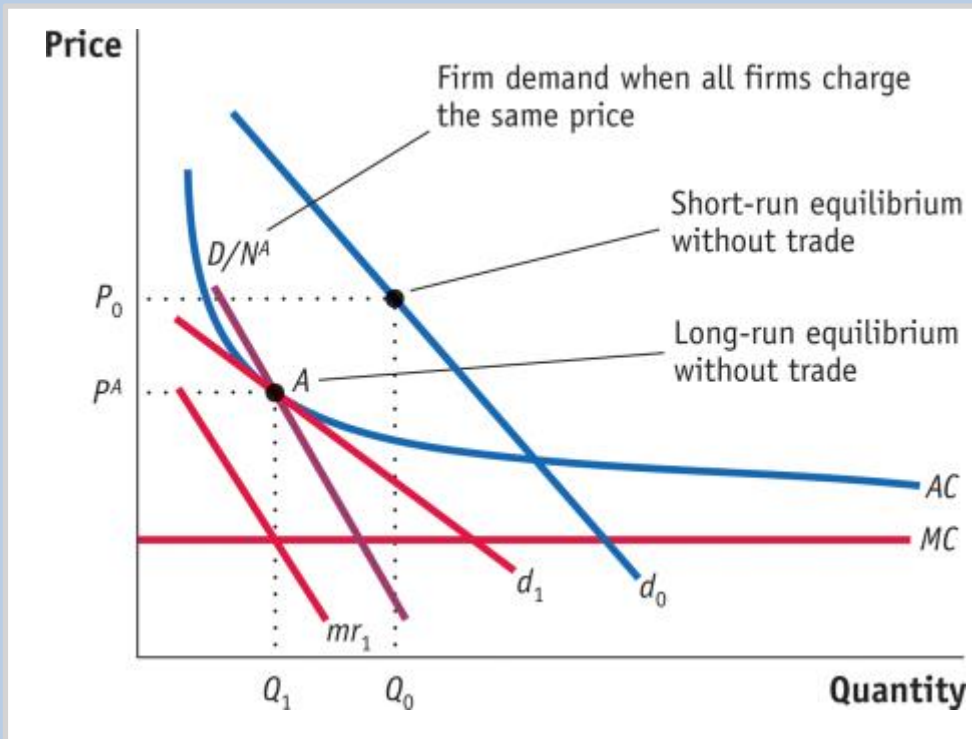
At that quantity, the no-trade price, P^A, equals average costs at point A.

Equilibrium Without Trade

Long-Run Equilibrium

Long-Run Monopolistic Competition Equilibrium Without Trade (continued)

In the long-run equilibrium, firms earn zero monopoly profits and there is no entry or exit. The quantity produced by each firm is less than in short-run equilibrium (Figure 6-4). Q_1 is less than Q_0 because new firms have entered the industry.

With a greater number of firms and hence more varieties available to consumers, the demand for each variety d_1 is less then d_0. The demand curve D/N^A shows the no-trade demand when all firms charge the same price.

Equilibrium with Free Trade

Short-Run Equilibrium with Trade

Assume Home and Foreign are exactly the same.

- Same number of consumers, same technology and cost curves, same number of firms in the no-trade equilibrium.

Without economies of scale, there would be no reason for trade. Similarly,

- under the Ricardian model, countries with identical technologies would not trade.

- under the Heckscher-Ohlin model, countries with identical factor endowments would not trade.

Under monopolistic competition, two identical countries will still engage in trade!

Equilibrium with Free Trade

Short-Run Equilibrium with Trade

- The number of firms in the no-trade equilibrium in each country is N^A.

- First, we will consider each country in long-run equilibrium without trade.

- When trade opens, the number of customers doubles.

- Since there are twice as many consumers, but also twice as many firms, the ratio stays the same.

- The product varieties also double.

- With the greater number of varieties available, the demand for each individual variety will be more elastic.

Equilibrium with Free Trade

Short-Run Equilibrium with Trade

| FIGURE 6-6 (1 of 2) | Short-Run Monopolistic Competition Equilibrium with Trade |
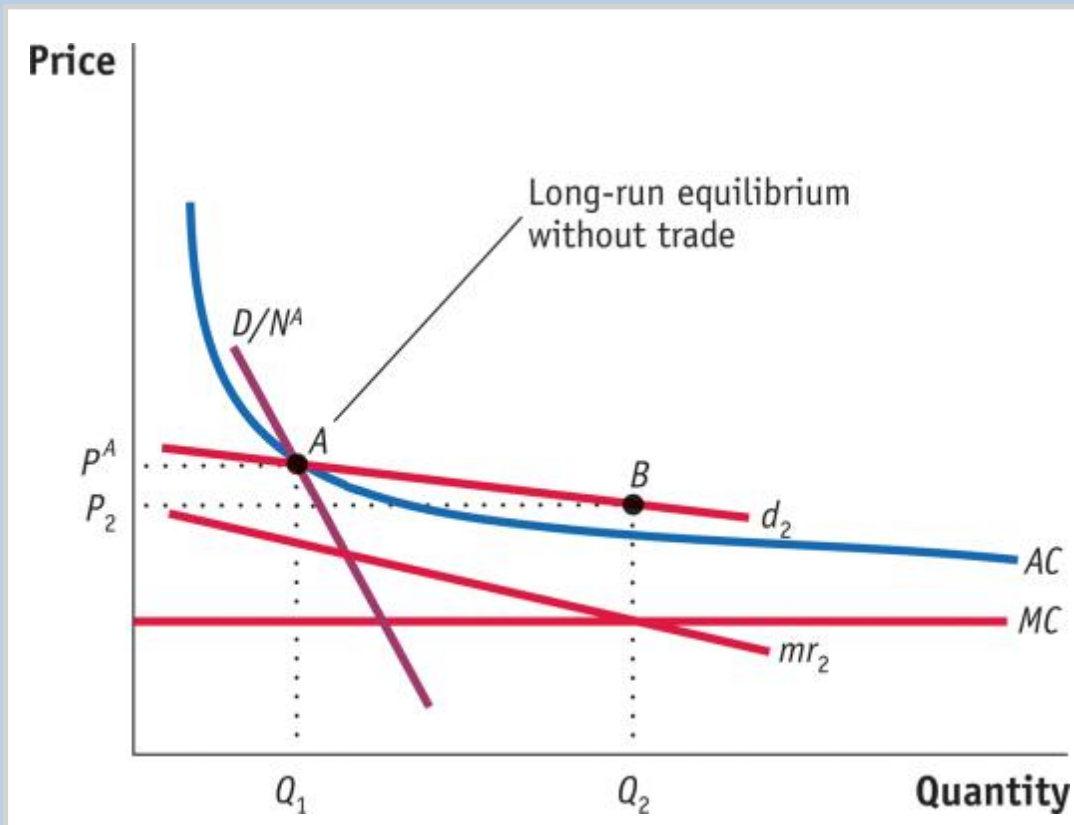
When trade is opened, the larger market makes the firm's demand curve more elastic, as shown by d_2 (with marginal revenue curve, mr_2).

The firm chooses to produce the quantity Q_2 at which marginal revenue equals marginal costs; corresponding to price of P_2.

With sales Q_2 at price P_2, the firm makes monopoly profits since price is greater than AC.

Equilibrium with Free Trade

Short-Run Equilibrium with Trade

FIGURE 6-6 (2 of 2) Short-Run Monopolistic Competition Equilibrium with Trade (continued)
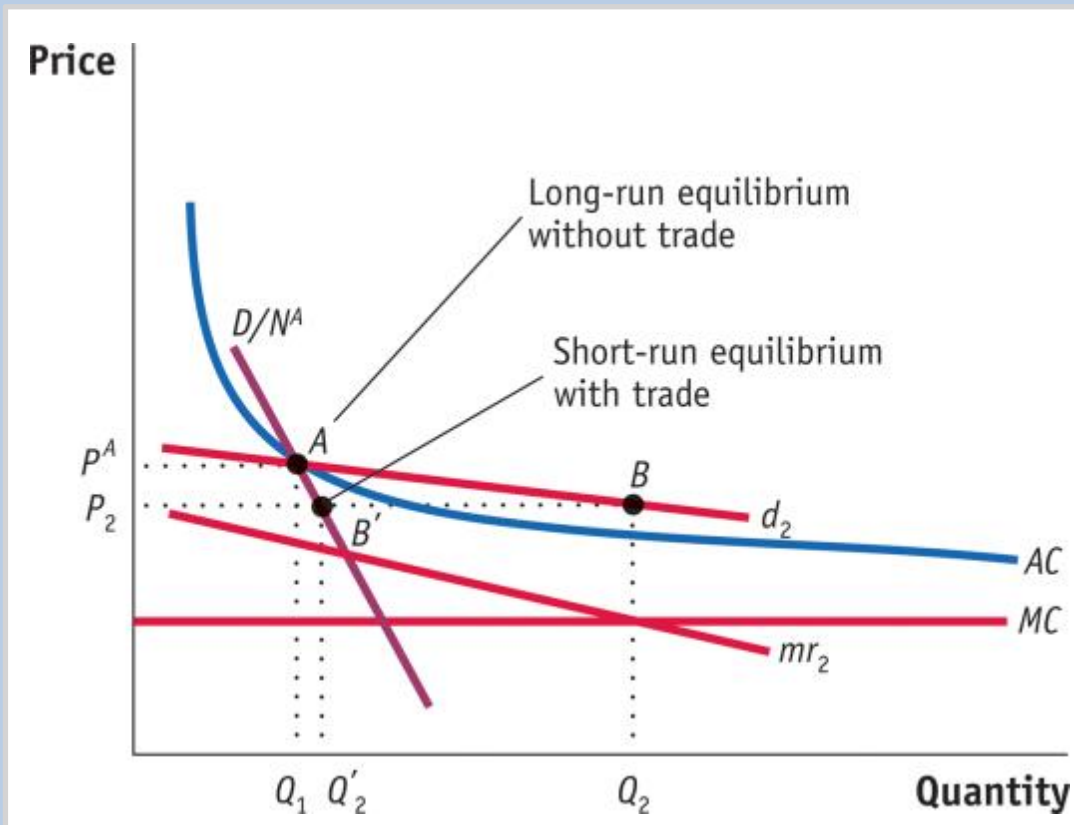
When *all* firms lower their prices to P_2, however, the relevant demand curve is D/N^A, which indicates that they can sell only Q'_2 at price P_2.

At this short-run equilibrium (point B'), price is less than average cost and all firms incur losses.

As a result, some firms are forced to exit the industry.

20

Equilibrium with Free Trade

Long-Run Equilibrium with Trade

- Since firms are making losses, some of them will exit the industry.

- Firm exit will increase demand for the remaining firms' products and decrease the available product varieties to consumers.

- We now have N^T firms which is fewer than the N^A firms we had before.

- The new demand D/N^T lies to the right of D/N^A.

Equilibrium with Free Trade

Long-Run Equilibrium with Trade

| FIGURE 6-7 (1 of 2) | Long-Run Monopolistic Competition Equilibrium with Trade |
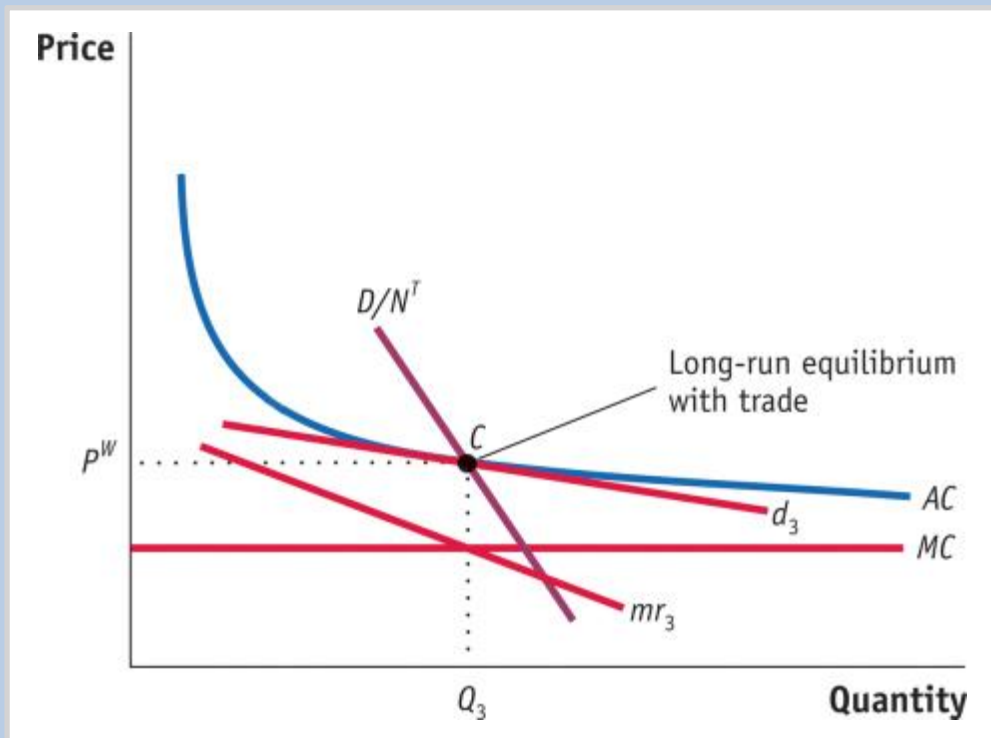
The long-run equilibrium with trade occurs at point C.

At this point, profits are maximized for each firm producing Q_3 (which satisfies $mr_3 = MC$) and charging price P^W (which equals AC). Since monopoly profits are zero when price equals average cost, no firms enter or exit the industry.

Equilibrium with Free Trade

Long-Run Equilibrium with Trade

FIGURE 6-7 (2 of 2) Long-Run Monopolistic Competition Equilibrium with Trade (continued)
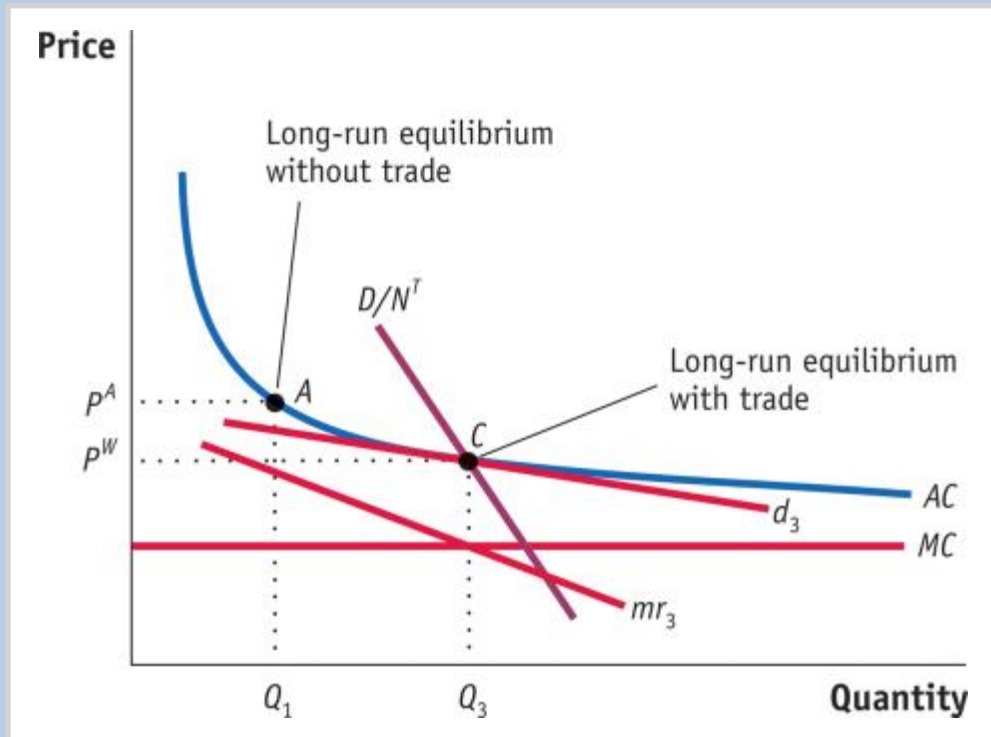
Compared with the long-run equilibrium without trade (Figure 6-5), d_3 (along with mr_3) has shifted out as domestic firms exited the industry and has become more elastic due to the greater total number of varieties with trade, $2N^T > N^A$.

Compared with the long-run equilibrium without trade at point A, the trade equilibrium at point C has a lower price and higher sales by all surviving firms.

Equilibrium with Free Trade

Gains from Trade

The long-run equilibrium at point *C* has two sources of gains from trade for consumers:

1. *A drop in price.*

   The lower price is a result of increased productivity of the surviving firms coming from increasing returns to scale.

2. *An increase in variety.*

   Although there are fewer product varieties made within each country (by fewer firms), consumers have more product variety because they can choose products of the firms from both countries after trade.

Equilibrium with Free Trade

Adjustment Costs from Trade

- There are adjustment costs associated with monopolistic competition, as some firms shut down or exit the industry.

- Workers in those firms experience a spell of unemployment.

- Over the long run, however, we could expect those workers to find new jobs, so these costs are temporary.

- We will examine both short-run and long-run adjustment costs.

- Next, we look at evidence from Mexico, Canada, and the United States following the North American Free Trade Agreement (NAFTA).

Gains and Adjustment Costs for Canada Under NAFTA

- In Canada, there were very large initial declines in employment. Over time, however, these job losses were more than made up for by the creation of new jobs elsewhere in manufacturing.

- Productivity growth in Canada allowed for a modest rise in real earnings.

HEADLINES

The Long and Short of the Canada–U.S. Free Trade Agreement

University of Toronto Professor Daniel Trefler studied the short-run effect of the Canada–United States Free Trade Agreement on employment in Canada, and the long-run effect on productivity and wages.

Gains and Adjustment Costs for Mexico Under NAFTA

- NAFTA resulted in a decrease in tariffs. How did the fall in tariffs affect the Mexican economy?

- NAFTA also increased the productivity of the maquiladora plants over and above the increase in productivity that occurred in the rest of Mexico.

- For workers, however, there was a fall of more than 20% in real wages in both manufacturing and agriculture, despite a rise in productivity.

AP Photo/Robert F. Bukaty

Mexico is waiting for its trucks to be allowed to cross the border for long-haul trips into the United States.

HEADLINES

NAFTA Turns 15, Bravo!

This editorial discussed the impact of NAFTA on the U.S. and Mexican economies. It appeared in a U.S.-based pro-business publication focusing on Latin-American businesses.

HEADLINES

Nearly 20 Years After NAFTA, First Mexican Truck Arrives In U.S. Interior

AP Photo/Robert F. Bukaty

A truck crosses the border between Mexico and the United States on October 21, 2011.

On October 21, 2011, the first big-rig truck from Mexico crossed the border into Laredo, Texas, under a trucking program that was agreed to in NAFTA but that took 17 years to implement.

- The Obama administration signed an agreement with Mexico to end the long dispute over the NAFTA provision in July.

- The long-delayed door-to-door delivery was launched with a bi-national ceremony at the international bridge "World Trade" in Laredo, Tex., the entry point for 40% of products imported from Mexico.

Gains and Adjustment Costs for Mexico Under NAFTA
Productivity, Real Wages and Incomes in Mexico

FIGURE 6-8

(a) Labor Productivity in Mexican Manufacturing Plants

(b) Real Wages and Income in Mexican Manufacturing Plants
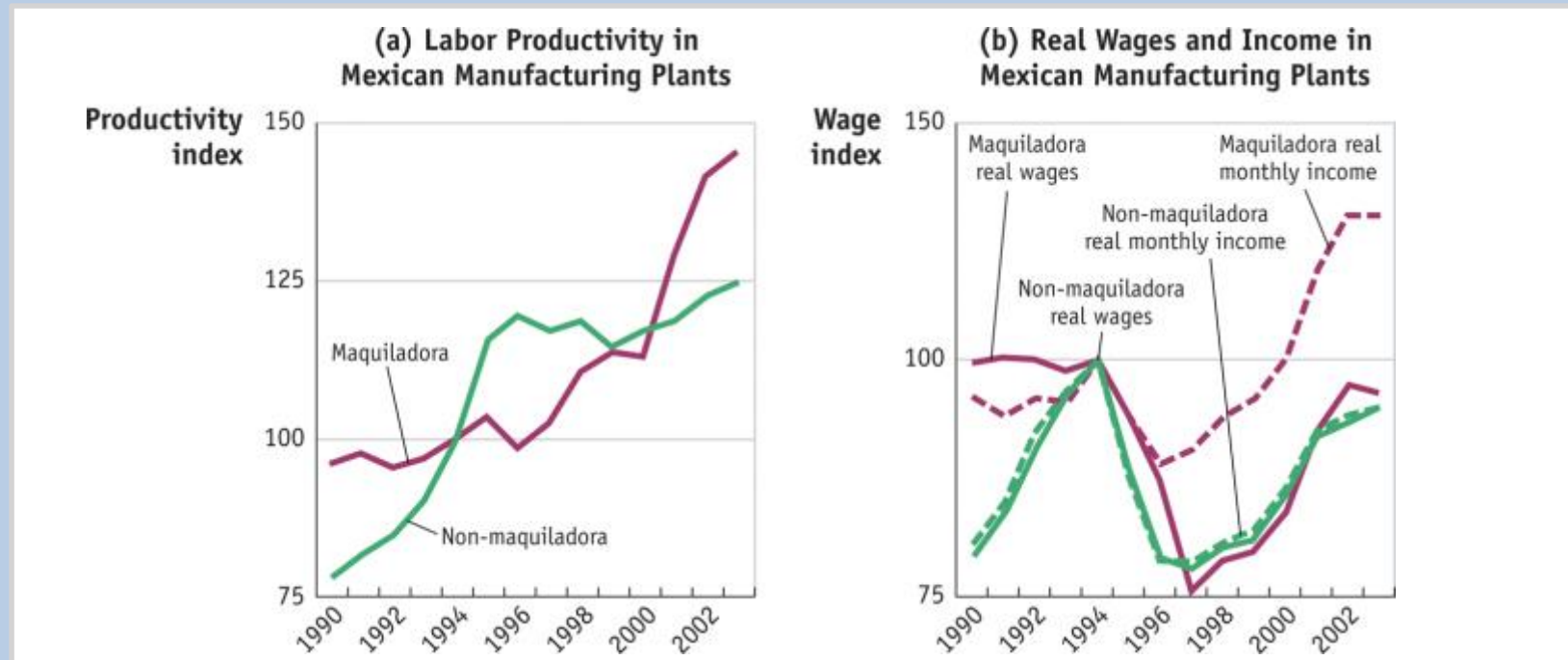
Labor Productivity and Wages in Mexico Panel (a) shows labor productivity for workers in the maquiladora Mexican manufacturing plants and for workers in non-maquiladora plants in the rest of Mexico.

Panel (b) shows wages and monthly income for workers in maquiladora and non-maquiladora plants. Productivity and real monthly income grew faster in the maquiladora plants because of increased trade with the United States.

Gains and Adjustment Costs for Mexico Under NAFTA

Adjustment Costs in Mexico

- Farmers growing corn in Mexico did not suffer as much as was feared.

  o The poorest farmers can always consume the corn they grow, rather than sell it.

  o The Mexican government also applied subsidies to offset the reduction in income for corn farmers.

- The total production of corn in Mexico actually rose after NAFTA.

- The maquiladoras face increasing international competition (not all due to NAFTA), which can be expected to raise the volatility of its output and employment.

Gains and Adjustment Costs for the United States Under NAFTA

Studies of NAFTA on the U.S. economy have not estimated its effects on the productivity of U.S. firms.

- Among the reasons is that Mexico and Canada are only two of many trading partners with the U.S.

- Researchers have explored a second source of gains from trade: the expansion of import varieties available to consumers.

- We turn now to an analysis that compares the long-run gains to consumers in the U.S. from expanded product varieties against the short-run adjustment costs caused by the exit of firms and the resulting unemployment.

The North American Free Trade Agreement

Gains and Adjustment Costs for the United States Under NAFTA

Expansion of Variety to the United States

TABLE 6-3

Mexico's Export Variety to the United States, 1990-2001 This table shows the extent of variety in Mexican exports to the United States, by industry. From 1990 to 2001, export variety grew in every industry, as U.S. tariffs were reduced due to NAFTA. All figures are percentages.

	Agriculture	Textiles and Garments	Wood and Paper	Petroleum and Plastics	Mining and Metals	Machinery and Transport	Electronics	Average
1990	42%	71%	47%	55%	47%	66%	40%	52%
2001	51	83	63	73	56	76	66	67
Annual growth	1.9	1.4	2.6	2.5	1.7	1.3	4.6	2.2

The North American Free Trade Agreement

Gains and Adjustment Costs for the United States Under NAFTA

Adjustment Costs in the United States

- One way to measure the temporary unemployment as firms exit is to look at the claims under the U.S. **Trade Adjustment Assistance (TAA)** provisions. The TAA program offers assistance to workers in manufacturing who lose their jobs because of import competition.

- From 1994-2002, about 525,000 workers, or about 58,000 per year, lost their jobs and were certified as adversely affected by trade under the NAFTA-TAA program.

- The annual number of workers displaced in manufacturing was 4 million or 444,000 workers per year. The NAFTA layoffs of 58,000 workers would correspond to about 13% of total displacement—this is a substantial amount.

Gains and Adjustment Costs for the United States Under NAFTA

Adjustment Costs in the United States

How can we measure the loss of wages of the displaced workers?

- In Chapter 3 we learned that about 56% of workers laid off in manufacturing are re-employed within three years.

- Suppose that the average length of unemployment for laid off workers is 3 years. If the average yearly earnings for manufacturing workers was $31,000 in 2000, then:

  1. Each displaced worker lost $93,000 in wages.

  2. This amounts to $5.4 billion per year during the first nine years of NAFTA.

Gains and Adjustment Costs for the United States Under NAFTA

Adjustment Costs in the United States

- The estimated private costs of $5.4 billion are nearly equal to the average welfare gains of $5.5 billion.

- However, keep in mind that the gains continue to grow over time and the job losses are only temporary, and fall over time.

- Unfortunately, in 2002 the NAFTA-TAA program was consolidated with the general TAA program, so there is no further data we can use which is specific to NAFTA.

- We know that under the consolidated program, there are still some limitations in addressing the needs of laid-off workers due to trade competition.

Gains and Adjustment Costs for the United States Under NAFTA

Summary of NAFTA

The monopolistic competition model has two sources of gains from trade:

- the rise in productivity due to expanded output by surviving firms, which leads to lower prices, and

- the expansion in the overall number of varieties of products available to consumers with trade, despite the exit of some firms in each country.

Gains and Adjustment Costs for the United States Under NAFTA

Summary of NAFTA

- For the U.S., the long-run gains have consisted of an expansion of varieties, and a fall in consumer prices.

- It is clear that for Canada and the U.S., the long-run gains considerably exceed the short-run costs.

- In Mexico, the gains have not translated into the growth of real wages for workers.

- However, the real earnings of higher-income workers in the maquiladora sector have risen. They have been the principal beneficiaries of NAFTA so far.

Index of Intra-Industry Trade

The **index of intra-industry trade** tells us what proportion of trade in each product involves both imports and exports:

- a high index (up to 100%) indicates that an equal amount of the good is imported and exported,

- whereas a low index (0%) indicates that the good is either imported or exported but not both.

$$(\text{Index of intra-industry trade}) = \frac{\text{Minimum of imports and exports}}{\frac{1}{2}\,(\text{Imports} + \text{exports})}$$

Index of Intra-Industry Trade

TABLE 6-4

Index of Intra-Industry Trade for the United States, 2012 Shown here are value of imports, value of exports, and the index of intra-industry trade for a number of products. When the value of imports is close to the value of exports, such as for golf clubs, then the index of intra-industry trade is highest, and when a product is mainly imported or exported (but not both), then the index of intra-industry trade is lowest.

Product	Value of Imports ($ millions)	Value of Export ($ millions)	Index of Intra-Industry Trade (%)
Vaccines	1,731	2,514	82
Whiskey	1,457	1,008	82
Frozen orange juice	24	16	81
Natural gas	8,292	4,346	69
Mattresses	195	59	46
Golf clubs	476	122	41
Small cars	77,086	19,478	40
Apples	169	826	34
Sunglasses	1,287	248	32
Golf carts	12	137	16
Telephones	615	38	12
Large passenger aircraft	4,588	84,171	10
Men's shorts	768	7	2

The Gravity Equation

- Dutch economist and Nobel laureate, Jan Tinbergen, was trained in physics and thought of comparing the trade between countries to the force of gravity between objects.

- In physics, objects with a larger mass, or those that are close together, have greater gravitational pull between them.

- In economics, the gravity equation for trade states that countries with larger GDPs, or that are close to each other, will have more trade between them.

The Gravity Equation

Newton's Universal Law of Gravitation

- Suppose you have two objects with masses, M_1 and M_2, and they are located distance d apart.

- The force of gravity between these two masses is:

$$F_g = G \cdot \frac{M_1 \cdot M_2}{d^2}$$

- The larger the objects are or the closer they are, the greater the force of gravity between them.

- In the case of trade, the larger the two countries are, or the closer they are, the greater the amount of trade.

Intra-Industry Trade and the Gravity Equation

The Gravity Equation

Newton's Universal Law of Gravitation

$$F_g = G \cdot \frac{M_1 \cdot M_2}{d^2}$$

The Gravity Equation in Trade

$$\text{Trade} = B \cdot \frac{GDP_1 \cdot GDP_2}{dist^n}$$

Deriving the Gravity Equation

$$\text{Trade} = \frac{GDP_1 \cdot Share_2}{dist^n} = \left(\frac{1}{GDP_W}\right) \frac{GDP_1 \cdot GDP_2}{dist^n}$$

The Gravity Equation

- The gravity equation has important implications for the monopolistic competition model with trade.

- Larger countries export more because they produce more product varieties, and import more because their demand is higher.

- The demand for Country 1's goods depends on:

  o the relative size of the importing country

  o the distance between the two countries

- To measure the relative size of a country, we use its share of world GDP: $\text{Share}_2 = \text{GDP}_2/\text{GDP}_W$

The Gravity Equation for Canada and the United States

FIGURE 6-9 (1 of 2)   Gravity Equation for the United States and Canada, 1993

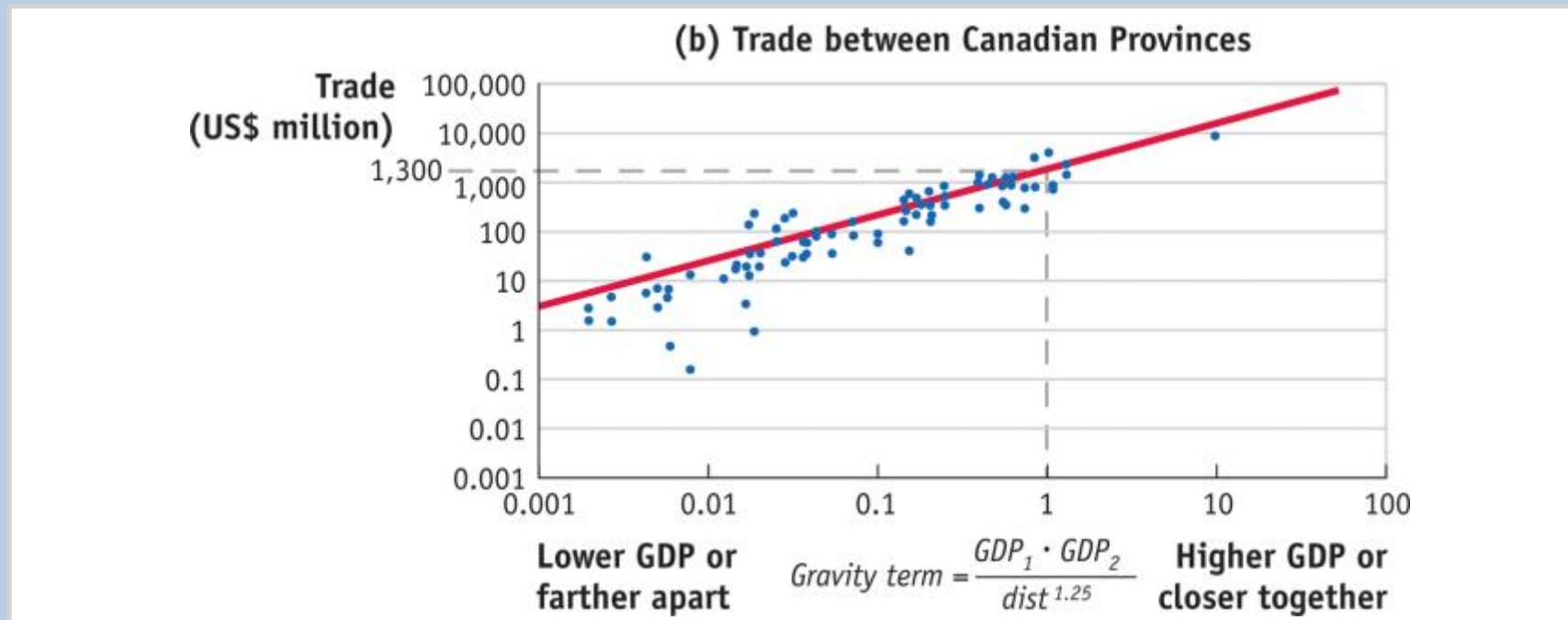(a) Trade between U.S. States and Canadian Provinces
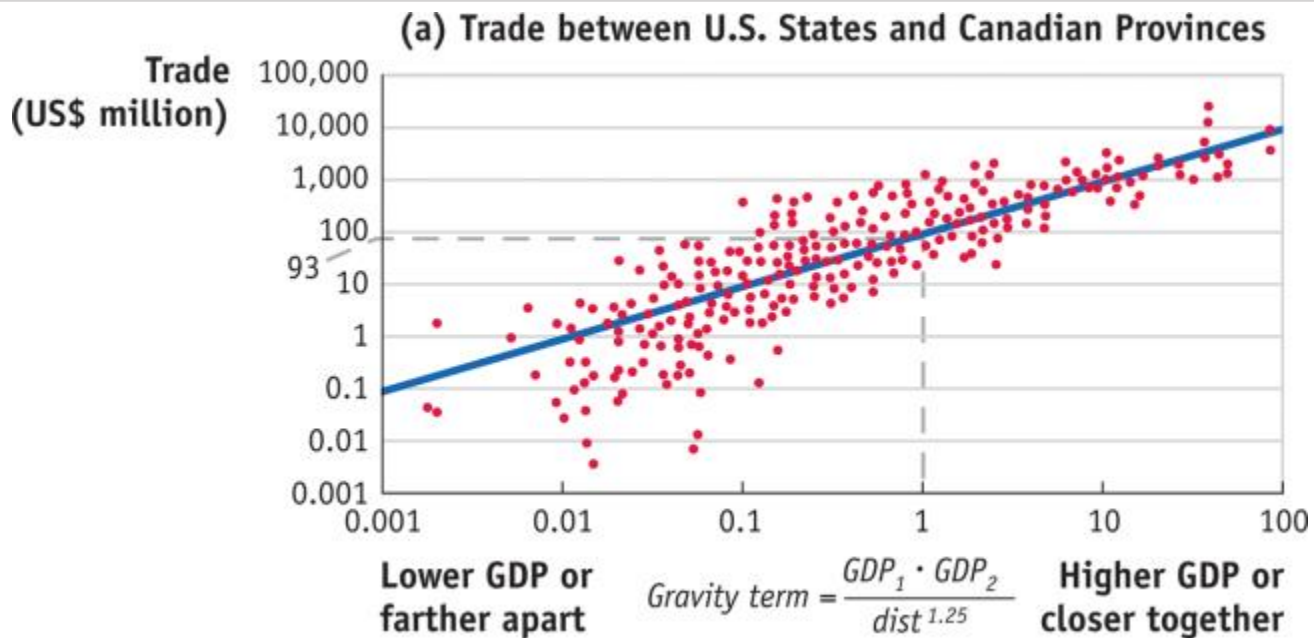
Plotted in these figures are the dollar value of exports in 1993 and the gravity term (plotted in log scale). Panel (a) shows these variables for trade between 10 Canadian provinces and 30 U.S. states. When the gravity term is 1, for example, the amount of trade between a province and state is $93 million.

APPLICATION

The Gravity Equation for Canada and the United States

FIGURE 6-9 (2 of 2) Gravity Equation for the United States and Canada, 1993 (continued)

(b) Trade between Canadian Provinces

Trade (US$ million) axis: 100,000 / 10,000 / 1,300 / 1,000 / 100 / 10 / 1 / 0.1 / 0.01 / 0.001

Horizontal axis: 0.001 / 0.01 / 0.1 / 1 / 10 / 100

Lower GDP or farther apart

$$\text{Gravity term} = \frac{GDP_1 \cdot GDP_2}{dist^{1.25}}$$

Higher GDP or closer together

Panel (b) shows these variables for trade between 10 Canadian provinces. When the gravity term is 1, the amount of trade between the provinces is $1.3 billion, 14 times larger than between a province and a state. These graphs illustrate two important points: there is a positive relationship between country size (as measured by GDP) and trade volume, and there is much more trade within Canada than between Canada and the United States.

The Gravity Equation for Canada and the United States

If trade across borders happens to be less than trade within countries, there must be barriers to trade between those countries.

Factors that make it easier or more difficult to trade goods between countries are often called **border effects,** and they include the following:

- Taxes imposed when imported goods enter into a country, **tariffs**

- Limits on the number of items allowed to cross the border, **quotas**

- Other administrative rules and regulations affecting trade, including the time required for goods to clear customs

- Geographic factors such as whether the countries share a border

- Cultural factors such as whether the countries have a common language that might make trade easier

Conclusions

- When firms have differentiated products and increasing returns to scale, there is a potential for gains from trade that did not exist in earlier models.

- The model of monopolistic competition shows that trade will occur between countries even if these countries are identical.

- There is trade within the same industries across countries because there is a potential to sell in a larger market.

- This will induce firms to lower their prices below those charged in the absence of trade.

- As firms exit, remaining firms increase their output and average cost falls. Lower costs results in lower prices for consumers in the importing country.

Conclusions

- Lower prices and higher product variety are the gains from trade under monopolistic competition.

- However, since some firms exit the market, there are short-run adjustment costs due to worker displacement.

- For a real-life example, we examined the short-run adjustment costs of NAFTA as well as the long-run gains for the three countries involved.

- Another good application of the monopolistic competition model is the "gravity equation."

- The gravity equation predicts that the larger two countries are, or the closer they are, the greater the amount of trade.