Chapter 6 – Increasing Returns to Scale and Monopolistic Competition

ECON 243 – International Trade

CHAPTER 6 – INCREASING RETURNS TO SCALE AND MONOPOLISTIC COMPETITION

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Questions to Consider

1. Why do countries export and import similar goods?
2. How much do consumers benefit from having products available from many countries?
3. Do all firms gain from having access to larger markets?

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TABLE 6-1 U.S. Imports and Exports of Golf Clubs, 2018

This table shows the value, quantity, and average price for golf clubs imported into and exported from the United States. Many of the same countries both sell golf clubs to and buy golf clubs from the United States, illustrating what we call intra-industry trade.

Rank	Country	Value of Imports ($ thousands)	Quantity of Golf Clubs (thousands)	Average Price ($/club)
1	China	$293,890	9,441	$31
2	Mexico	82,312	1,644	50
3	Vietnam	22,839	833	27
4	Japan	11,709	106	111
5	Taiwan	9,960	131	76
6	Canada	528	5.2	101
7	Hong Kong	503	6.6	76
8	Thailand	168	1.9	89
9	United Kingdom	159	2.1	76
10	South Korea	67	1.5	44
11	Australia	24	0.1	162
12	Germany	16	0.3	49
13-20	Various countries	47	0.6	83
	All 20 countries	422,222	12,174	35

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Introduction

Why does the United States 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 perfectly competitive markets, the goods produced are homogeneous. In this chapter, we assume that goods are differentiated, and we allow for imperfect competition.

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Chapter 6 – Increasing Returns to Scale and Monopolistic 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

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Introduction

- Most goods are differentiated goods; that is, they are not identical.
- When we allow for imperfect competition, firms can influence the prices they charge.
- Monopolistic competition has two key features:
  - The goods produced by different firms are differentiated.
  - Firms enjoy increasing returns to scale, by which we mean that the average costs for a firm fall as more output is produced.

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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.

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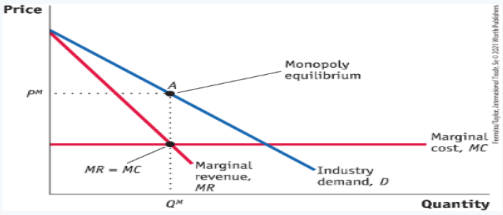
Basics of Imperfect Competition

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*.

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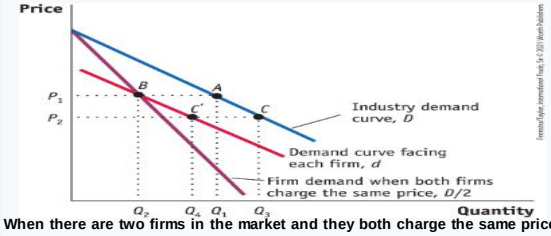
Chapter 6 – Increasing Returns to Scale and Monopolistic Competition

Basics of Imperfect Competition (Identical Goods)

Demand with Duopoly - FIGURE 6-2 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.

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Discussion (Identical goods)

- Notice that d is flatter than D/2; at any particular quantity, d is more elastic than D/2.
- In particular, at the point where d and D/2 intersect, d is more elastic than D/2. If the competitor held its price constant, then the firm that lowered its price could increase its market share at the expense of the competitor.
- But! The two firms are identical, so they behave exactly alike (independently, identically, and concurrently), and always set the same price. Thus, equilibrium price and quantity will always be on the D/2 demand curve. We could refer to the D/2 demand curve as each firm's market share demand curve.

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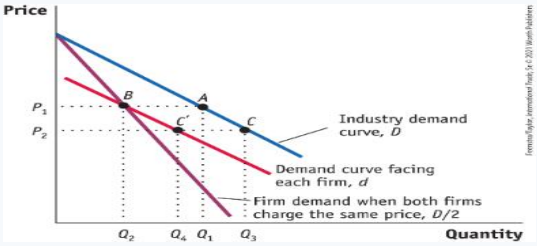
Basics of Imperfect Competition (Differentiated Goods)

Demand with Duopoly - FIGURE 6-2 Demand Curves with Duopoly



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'.

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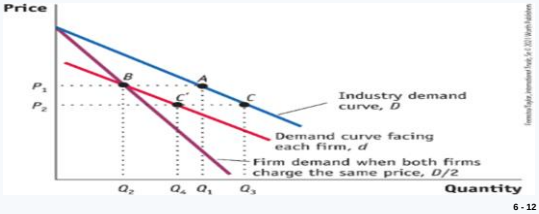
Myopic Demand Curve

Let's refer to the red demand curve labeled d as the firm's "myopic" or "naïve" demand curve.
This is the demand curve it believes it faces if the other firm's price is held constant.
It is as if the firm were oblivious of the presence of its competitor and equally oblivious of D/2.



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Chapter 6 – Increasing Returns to Scale and Monopolistic Competition

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.**

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*.**

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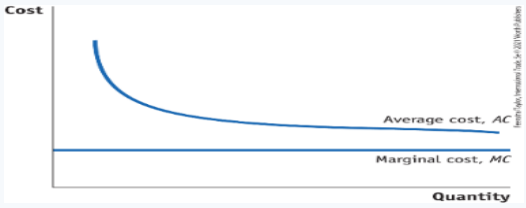
Trade Under Monopolistic Competition

Assumption 3: Firms produce using a technology with increasing returns to scale. FIGURE 6-3



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.

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Trade Under Monopolistic Competition

Numerical Example of Increasing Returns to Scale TABLE 6-2

Cost Information for the Firm This table illustrates increasing returns to scale, in which average costs fall as quantity rises.

Quantity *Q*	Variable Costs = *Q* · *MC* (*MC* = $10)	Total Costs = Variable Costs + Fixed Costs (*FC* = $100)	Average Costs = Total Costs/Quantity
10	$100	$200	$20
20	200	300	15
30	300	400	13.3
40	400	500	12.5
50	500	600	12
100	1,000	1,100	11
Large *Q*	10 · *Q*	10 · *Q* + 100	Close to 10

Whenever the price charged is above average costs, then a firm earns monopoly profits.

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Trade Under 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.**

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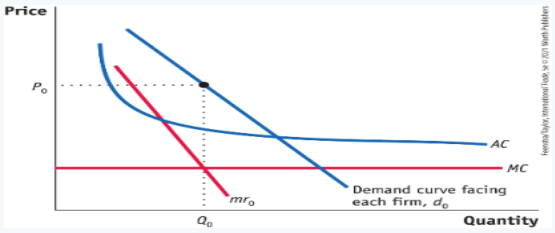
Chapter 6 – Increasing Returns to Scale and Monopolistic Competition

Equilibrium Without Trade Under Monopolistic 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 a monopoly profit. 6 - 17

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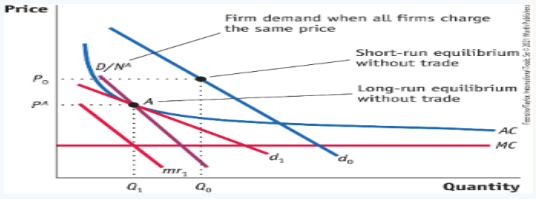
Equilibrium Without Trade Under Monopolistic Competition

Equilibrium Without Trade - Long-Run Equilibrium FIGURE 6-5



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*. 6 - 18

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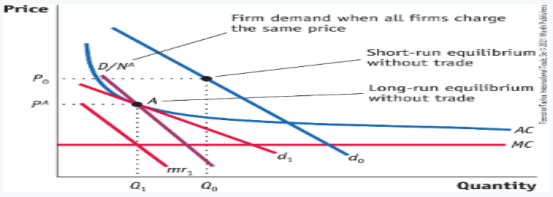
Equilibrium Without Trade Under Monopolistic Competition

Equilibrium Without Trade - Long-Run Equilibrium FIGURE 6-5



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. 6 - 19

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A Closer View

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Trade Under Monopolistic Competition

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 (no trade relative prices would be equal).
- Under the Heckscher–Ohlin model, countries with identical factor endowments would not trade. (no trade relative prices would be equal).

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Trade Under Monopolistic Competition

Equilibrium with Free Trade

Short-Run Equilibrium with Trade

- The number of firms in the no-trade equilibrium in each country is N^A. The quantity demanded from each firm when all firms charge the same price is D/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.

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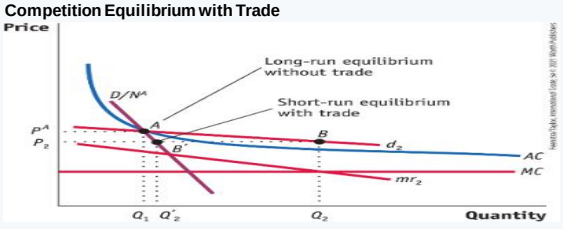
Trade Under Monopolistic Competition

Equilibrium with Free Trade - FIGURE 6-6 - 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 a price of P_2.

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

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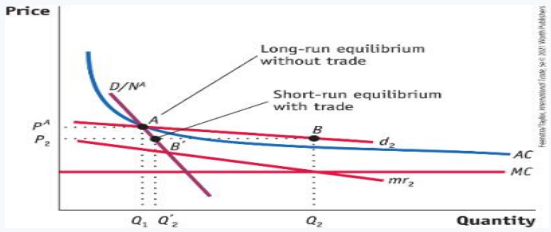
Trade Under Monopolistic Competition

Equilibrium with Free Trade - FIGURE 6-6 - Short-Run Monopolistic Competition Equilibrium with Trade



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.

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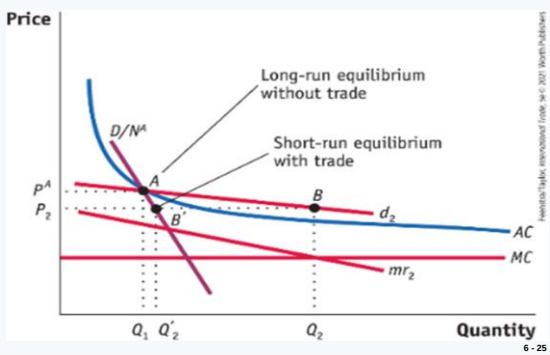
A Closer Look



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Trade Under Monopolistic Competition

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 (number of firms in each country after trade), which is fewer than the N^A firms we had before trade.**
- **The new demand D/N^T lies to the right of D/N^A.**
- **$D/N^T > D/N^A$.**

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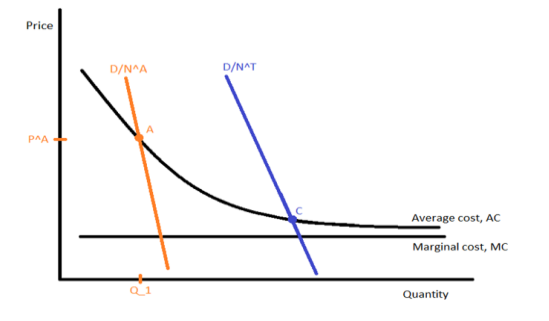
Slope of Market Share Line with Trade Flatter Since $D/N^T > D/N^A$.



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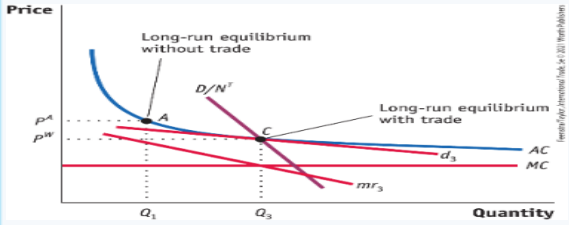
Trade Under Monopolistic Competition

Equilibrium with Free Trade - FIGURE 6-7 - 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.

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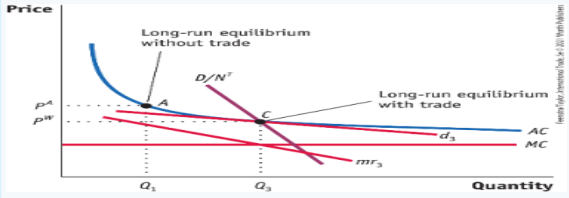
Trade Under Monopolistic Competition

Equilibrium with Free Trade - FIGURE 6-7 - Long-Run Monopolistic Competition Equilibrium with Trade



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.

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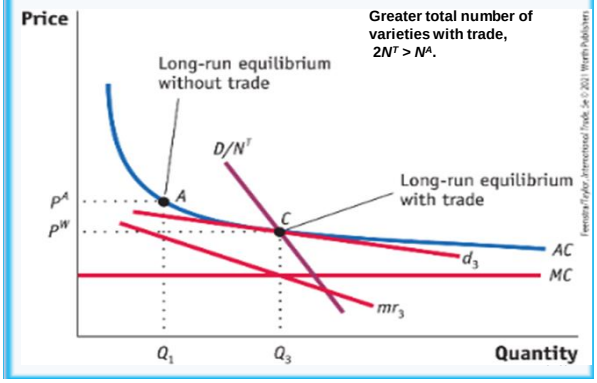
A Closer Look



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Long-Run

It must be that

$$N^T < N^A$$

Firms in Home LR w/ trade — Firms in Home LR no trade

$$2N^T > N^A$$

Varieties available Home consumer LR w/ trade — Varieties available Home consumer LR no trade

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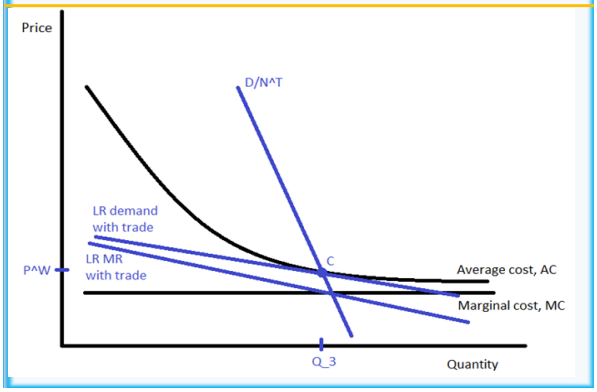
Long-run Equilibrium with Trade



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Trade Under Monopolistic Competition

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 the 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.

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Trade Under Monopolistic Competition

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 we view these costs are temporary.
- There are both short-run and long-run adjustment costs.

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Intra-Industry Trade and the Gravity Equation

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

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

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Intra-Industry Trade and the Gravity Equation

Index of Intra-Industry Trade - TABLE 6-5

Product	Value of Imports ($ millions)	Value of Exports ($ millions)	Index of Intra-Industry Trade (%)
Natural gas	$6,546	$4,551	82%
Whiskey	2,157	1,360	77
Vaccines	5,754	2,364	58
Telephones	273	90	50
Golf clubs	422	140	50
Mattresses	413	106	41
Apples	241	940	41
Golf carts	35	137	41
Sunglasses	1,657	399	39
Frozen orange juice	10	2	33
Small cars	106,478	17,394	28
Large passenger aircraft	4,400	187,477	5
Men's shorts	1,172	26	4

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Intra-Industry Trade and the Gravity Equation

The Gravity Equation

- Dutch economist and Nobel laureate Jan Tinbergen was trained in physics and thought about 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.

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Intra-Industry Trade and the Gravity Equation

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 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.

The Gravity Equation in Trade

$$\text{Trade} = B \cdot \frac{GDP_1 \cdot GDP_2}{dist^n}$$ (B is a constant)

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Intra-Industry Trade and the Gravity Equation

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 they import more because their demand is higher.
- The demand for Country 1's goods depends on:
  - The relative size of the importing country
  - The distance between the two countries
- To measure the relative size of a country, we use its share of world GDP: $Share_2 = GDP_2/GDP_W$

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Deriving the Gravity Equation

- To derive the gravity equation, we assume that each country produces a differentiated product to apply the monopolistic competition model.
- With a differentiated product, the import demand for goods produced by Country 1 depends on (1) the relative size of the importing country and (2) the distance between the two countries.
- The relative size of the importing country (Country 2) is measured by its GDP as compared with the rest of the world.
- The distance between the two countries provides a measure for the transportation costs associated with exporting the good from one country to another.
- Using the distance between Country 1 and Country 2 raised to a power, or $dist^n$, we see that the exports from the former to the latter are equal to the following equation:

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

- By denoting the term (1/GDPW) as a constant term, B, we have the gravity equation.

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Estimating the Gravity Equation

The textbook discusses some empirical examples of gravity equations. Such equations can be quite general and are generally estimated using linear regression analysis. First, the gravity equation is linearized by taking the logarithms of both sides; second, it is generalized by multiplying the GDP variables by a coefficient that can be estimated from data on many (i,j) pairs of countries.

$$\log(T_{ij}) = \log(B_{ij}) + \beta \log(GDP_1 GDP_2) + \delta log(d_{ij}) + \varepsilon_{ij}.$$

Further generalization can be achieved by replacing B_{ij} by terms that contain additional explanatory variables, such as the presence of a common border, the absence of stringent labor regulations, indicators for various policies or policy regimes, and so on.

Variations of the gravity equation have provided the foundation for many hundreds of research papers about the determinants of international trade flows.

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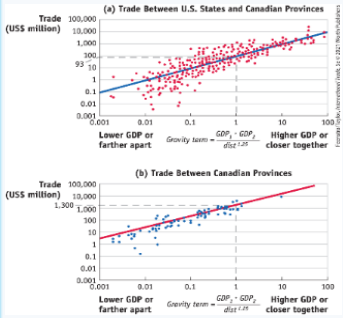
APPLICATION: The Gravity Equation for Canada and the United States

FIGURE 6-9 Gravity Equation for the United States and Canada, 1993



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.

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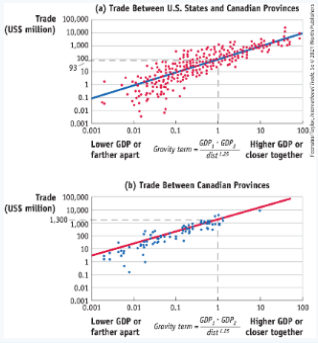
APPLICATION: The Gravity Equation for Canada and the United States

FIGURE 6-9 Gravity Equation for the United States and Canada, 1993



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.

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APPLICATION: 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

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Conclusions

- When firms have differentiated products and increasing returns to scale, the potential exists for gains from trade above and beyond those under perfect competition.
- 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 result in lower prices for consumers in the importing country.

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Conclusions

- Lower prices and higher product variety are the gains from trade under monopolistic competition.
- When some firms have to exit the market, short-run adjustment costs arise due to worker displacement.
- Examples from Canada, Mexico, and the United States demonstrated that the short-run adjustment costs are less than the long-run gains.
- Regional trade agreements like NAFTA and the USMCA are a good application of the monopolistic competition model.
- Another application 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.

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KEY POINTS

1. The monopolistic competition model assumes differentiated products, many firms, and increasing returns to scale. Firms enter whenever there are profits to be earned, so profits are zero in the long-run equilibrium.

2. When trade opens between two countries, the demand curve faced by each firm becomes more elastic, as consumers have more choices and become more price sensitive. Firms then lower their prices in an attempt to capture consumers from their competitors and obtain profits. When all firms do so, however, some firms incur losses and are forced to leave the market.

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KEY POINTS

3. Introducing international trade under monopolistic competition leads to additional gains from trade for two reasons: (i) lower prices as firms expand their output and lower their average costs and (ii) additional imported product varieties available to consumers. There are also short-run adjustment costs, such as unemployment, as some firms exit the market.

4. The assumption of differentiated goods helps us to understand why countries often import and export varieties of the same type of good. That outcome occurs with the model of monopolistic competition.

5. The gravity equation states that countries with higher GDP, or that are close, will trade more. In addition, research has shown that there is more trade within countries than between countries.

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