International Trade

6. Increasing Returns to Scale and Imperfect Competition

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1. Introduction

- Look at trade in golf clubs, a good that the U.S. imports and exports in large quantities.
- Table 6.1 shows the twelve countries that sell the most golf clubs to the U.S. and the twelve to which the U.S. sells the most.
- Many countries that sell to the U.S. are also buying from the U.S.
  - The total value of imports is close to the total value of exports.

1. Introduction

IMPORTS

Rank	Country	Value of Imports ($ millions)	Quantity of Golf Clubs (thousands)	Average Price ($/club)
1	China	$278.2	15,520	$18
2	Japan	11.0	100	109
3	Taiwan	6.7	504	13
4	Hong Kong	5.3	258	21
5	Thailand	1.4	57	25
6	South Korea	1.0	121	9
7	Canada	1.0	28	37
8	British Virgin Islands	0.4	72	5
9	United Kingdom	0.3	7	36
10	Vietnam	0.2	8	25
11	Australia	0.1	3	30
12	Mauritius	0.05	3	16
13–30	Various countries	0.1	3	41
	All 30 countries	$305.8	16,683	$18

Table 6.1 U.S. imports of golf clubs, 2005

1. Introduction

EXPORTS

Rank	Country	Value of Imports ($ millions)	Quantity of Golf Clubs (thousands)	Average Price ($/club)
1	United Kingdom	$83.9	1,266	$66
2	Japan	47.1	482	98
3	Canada	44.2	598	74
4	South Korea	41.8	477	88
5	Netherlands	21.7	265	82
6	Australia	21.3	294	73
7	Singapore	12.2	147	83
8	South Africa	11.7	121	96
9	Hong Kong	6.9	83	82
10	New Zealand	4.7	59	80
11	Taiwan	3.1	32	99
12	Thailand	2.2	20	110
13–83	Various countries	17.9	201	89
	All 83 countries	$318.7	4,046	$79

Table 6.1 U.S. exports of golf clubs, 2005

1. Introduction

- Why does the U.S. export and import golf clubs to and from the same countries?
  - Relax the assumption that markets are perfectly competitive: assume that goods are differentiated and allow for imperfect competition
  - Specifically we will consider **monopolistic competition**.
- Since goods from each firm are slightly differentiated, firms have some control over price.

1. Introduction

- Firms specialize because in monopolistic competition there are increasing returns to scale (IRS, also called economies of scale).
- IRS set monopolistic competition trade model apart from logic of Ricardian and Heckscher-Ohlin models.

- *Intra-industry trade* happens when countries specialize in different varieties of the same type of product and trade them.
- Imperfect competition model also predicts that larger countries will trade more with each other (gravity equation).

2. Basics of imperfect competition

- Monopolistic competition has some characteristics of monopoly and some of perfect competition.
  - Firms have control over the prices they charge.
  - Many firms are selling similar but slightly differentiated product.

2. Basics of imperfect competition

Monopoly Equilibrium (figure 6.1)

- Since monopoly faces market demand curve, it must lower the price in order to sell more.
- This means the marginal revenue curve lies below the demand curve.
  - Extra revenue earned from selling another unit is less than price.
- Monopolist will sell up to point where marginal revenue equals marginal cost and price comes from demand curve.
  - Assume marginal costs are constant for simplicity.

2. Basics of imperfect competition

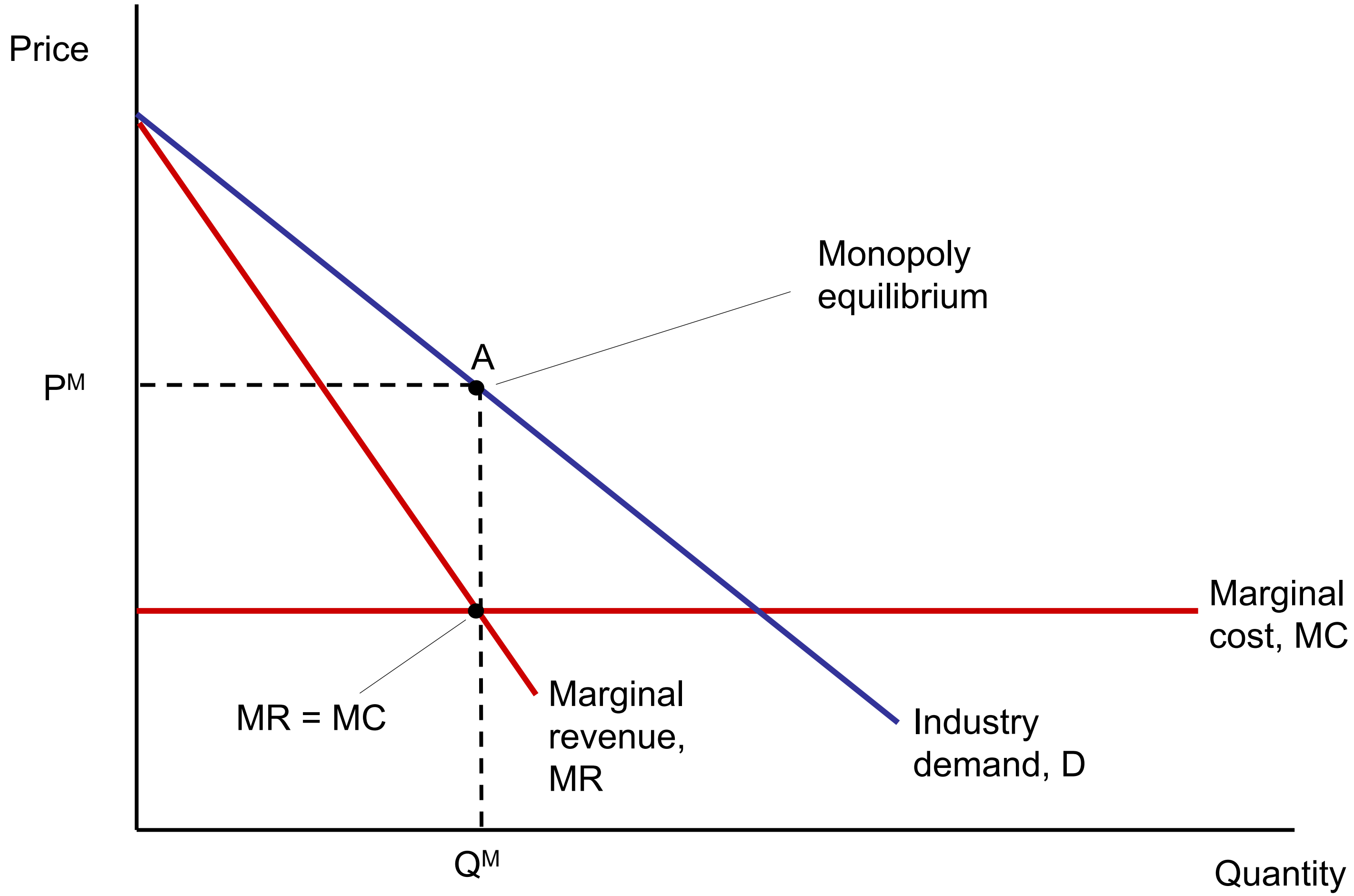


Figure 6.1
Monopoly
equilibrium

2. Basics of imperfect competition

Demand with Duopoly (figure 6.2)

- Two firms sell a product.
- Industry demand curve D and demand facing each firm, d.
- If both firms charge same price, they will each face D/2 and share market equally.
- If one firm charges different price, demand facing each firm changes.
  - With homogeneous good, lower-priced firm would get all demand market.
  - If goods are differentiated, lower-priced firm will capture more, but not all, of the market.

2. Basics of imperfect competition

Demand with Duopoly (cont'd)

- Since goods are differentiated, some consumers will choose to buy higher-price product.
- Demand curve for firm that lowered its price is flatter than the demand curve D/2 from before.
  - Each firm faces a more elastic demand curve than D/2.

2. Basics of imperfect competition

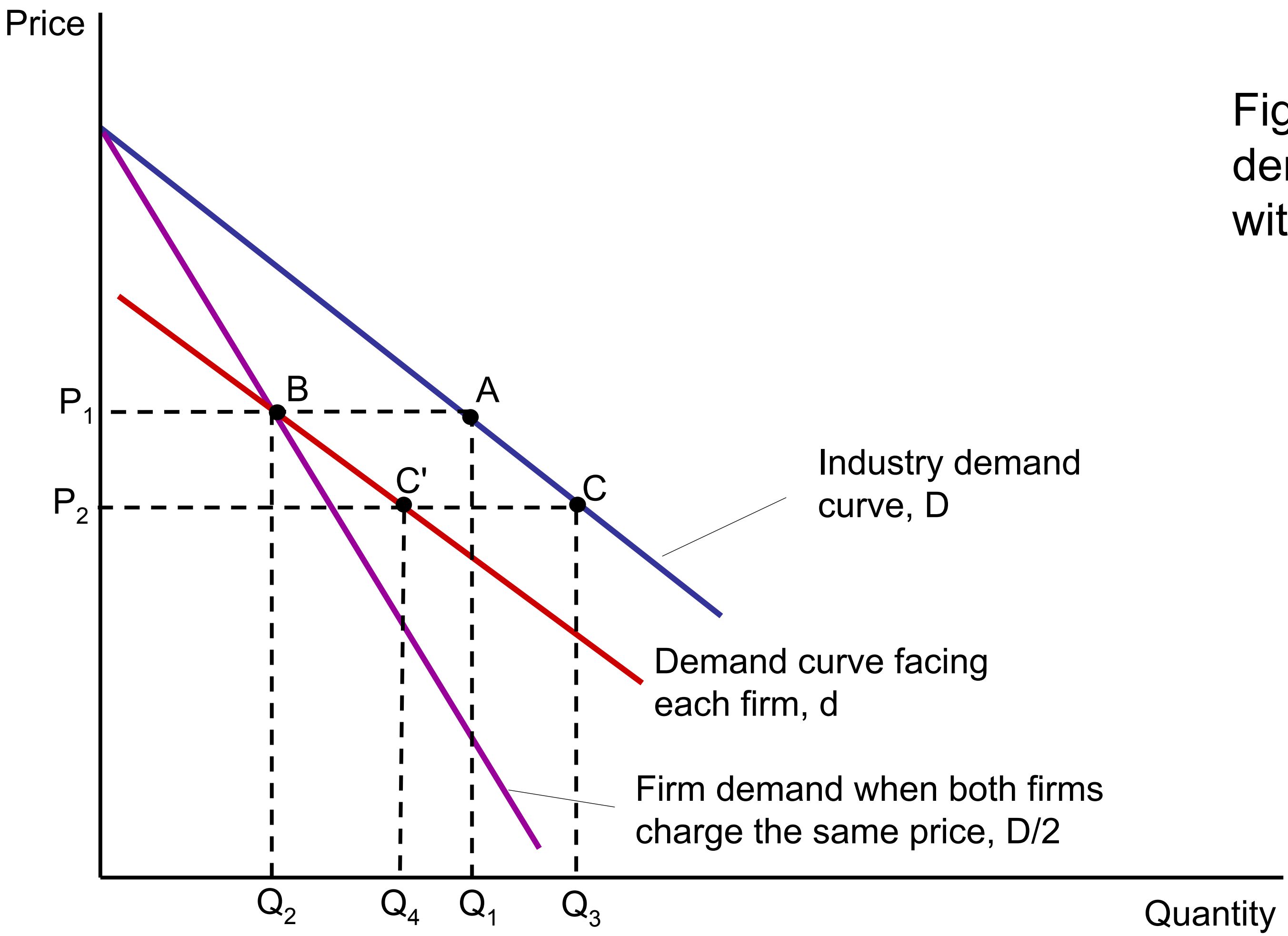


Figure 6.2
demand curves
with duopoly

3. Trade under monopolistic competition

4 assumptions

- *Assumption 1: each firm produces a good that is similar to, but differentiated from, the goods that other firms in the industry produce.*
  - Since the goods are differentiated, the firm can raise prices without losing all its customers.
  - Each firm faces a downward-sloping demand for their product.

3. Trade under monopolistic competition

- *Assumption 2: there are many firms in the industry.*
  - If there are N firms, then D/N is the share each firm faces if all charge the same price.
  - If only one firm lowers its price though, it will face a flatter demand, d.
- *Assumption 3: firms produce using a technology with increasing returns to scale.*
  - Average costs of production fall as quantity produced increases.
  - Marginal costs must lie below average costs.

3. Trade under monopolistic competition

– It is assumed that a firm must incur some large fixed cost *F* (plant, equipment) in order to start production but can thereafter produce at constant marginal costs of production of good X MC_x.

– Formally:

  - Total costs are $TC_x = F + MC_x \cdot X$; dividing by X gives us average costs $AC_x = TC / X = F / X + MC_x$
  - Average costs AC_x fall as fixed costs are spread out over larger output; they approach but never arrive at marginal costs MC_x.
  - Price under monopolistic competition must be higher than under perfect competition ($p = MC_x$).

3. Trade under monopolistic competition

- *Assumption 4: firms can enter and exit the industry freely, so that 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.

3. Trade under monopolistic competition

Equilibrium Without Trade

- Short-Run Equilibrium
  - Figure 6.4 shows monopolistically competitive firm.
  - Each firm maximizes profits by producing Q_0, where MR=MC.
  - Price is from the demand curve at P_0.
  - Since price is greater than average cost, the firm is earning positive monopoly profits.

3. Trade under monopolistic competition

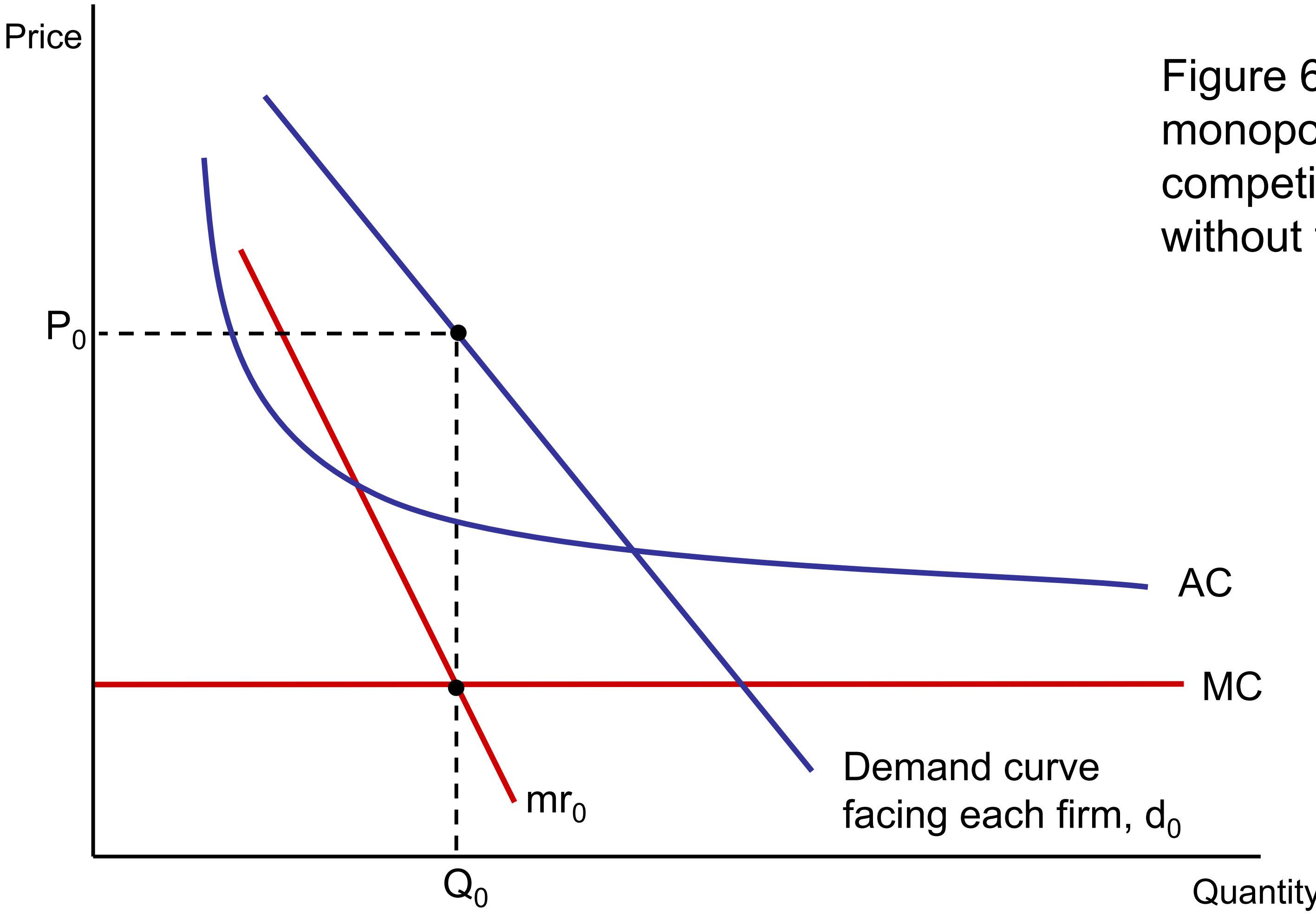


Figure 6.4 Short-run monopolistic competition equilibrium without trade

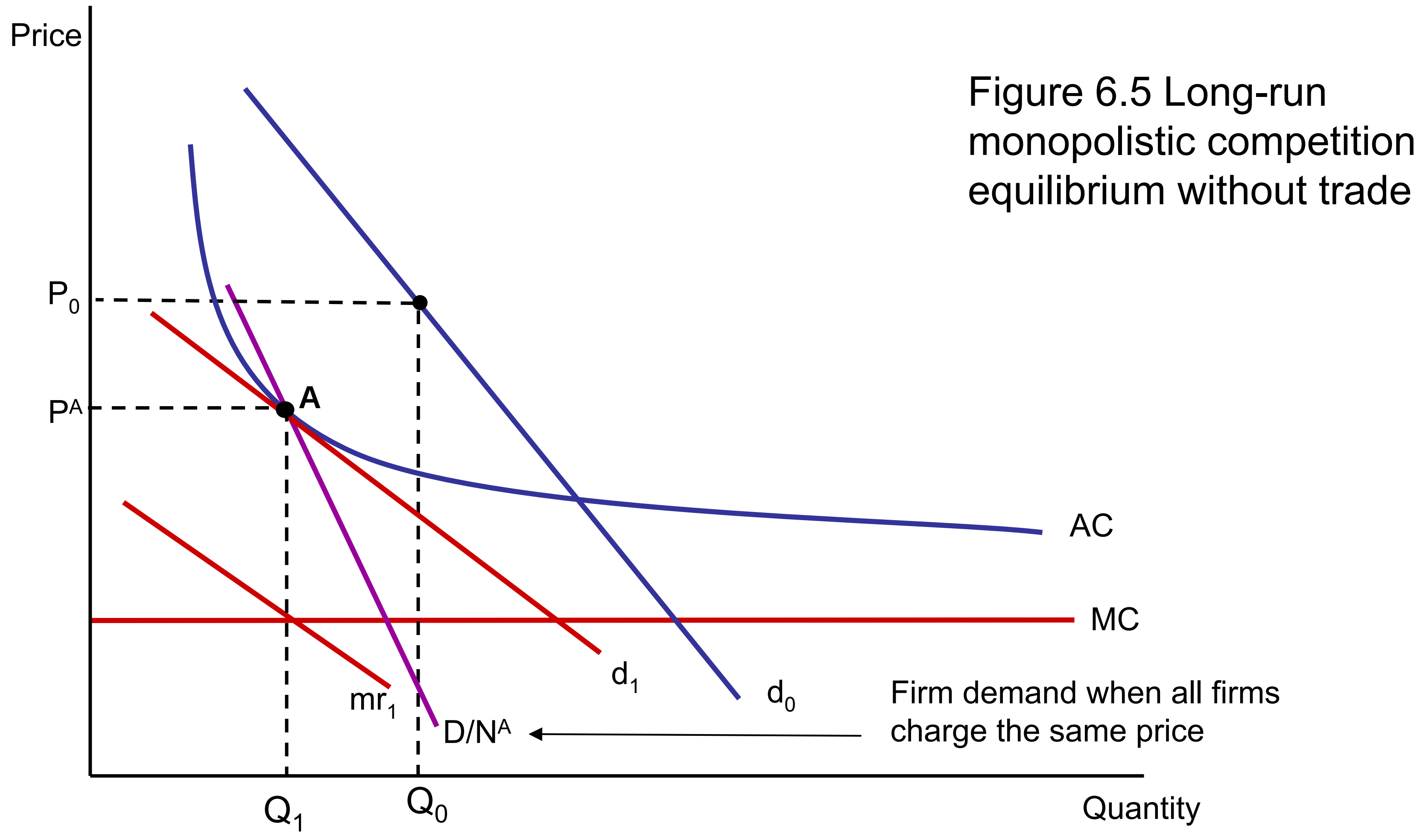
3. Trade under monopolistic competition

- Long-Run Equilibrium (figure 6.5)
  - Since firms are making positive profits, firms will enter the industry.
  - Demand for existing firms will fall until no firm is earning positive profits.
    - As more firms enter, existing industry demand is divided among more firms; more product varieties available to consumers.
    - Demand curve faced by each firm shifts left and becomes more elastic (flatter).
    - This occurs until all firms are earning zero profits and no more incentive to enter market.

3. Trade under monopolistic competition

- Long-Run Equilibrium (cont'd)
  - MR=MC at Q_1 charging price P^A
  - P^A=AC at Q_1 so firms are earning zero profits.
  - The long run demand curve, d_1, is to the left of and more elastic than the short-run demand curve, d_0.

3. Trade under monopolistic competition



3. Trade under monopolistic competition

Equilibrium With Free Trade

- Assume Home and Foreign are exactly the same.
  - Same number of consumers, same technology and cost curves, same number of firms in no-trade equilibrium
- Without economies of scale, no reason for trade.
  - Under Ricardian model, countries with identical technologies would not trade.
  - Under the HO model, countries with identical factor endowments would not trade.
  - However, under monopolistic competition, two identical countries will still engage in trade.

3. Trade under monopolistic competition

- Short-Run Equilibrium with Trade (figure 6.6)
  - Number of firms in no-trade equilibrium in each country is N^A.
  - Start with each country in long-run equilibrium without trade.
  - When trade opens, number of customers available to each firm doubles.
  - Twice as many consumers but also twice as many firms, so ratio stays the same.
  - Product varieties also double.

3. Trade under monopolistic competition

- Short-Run Equilibrium with Trade (cont'd)
  - With greater number of varieties available, demand for each individual variety will be more elastic.
    - If one firm drops its price below the no-trade price, it will get even more customers away from other firms.
    - ➔ Demand curve, d_2, which is more elastic than the no-trade demand, d_1.
  - After trade, new demand no longer tangent to AC.
    - Each firm now produces at Q_2 charging $P_{2.}$
    - Firms make positive monopoly profits.
    - This shows the firm's incentive to lower its price.

3. Trade under monopolistic competition

- Short-Run Equilibrium with Trade (cont'd)
  - Every firm in industry has same incentive—lower price and gain many more consumers and more profits.
  - If all firms lower prices, quantity demanded from each firm increases along D/N^A, instead of d_2.
  - In short run, firms lower prices expecting to make profits at B, but end up with losses at B′.

3. Trade under monopolistic competition

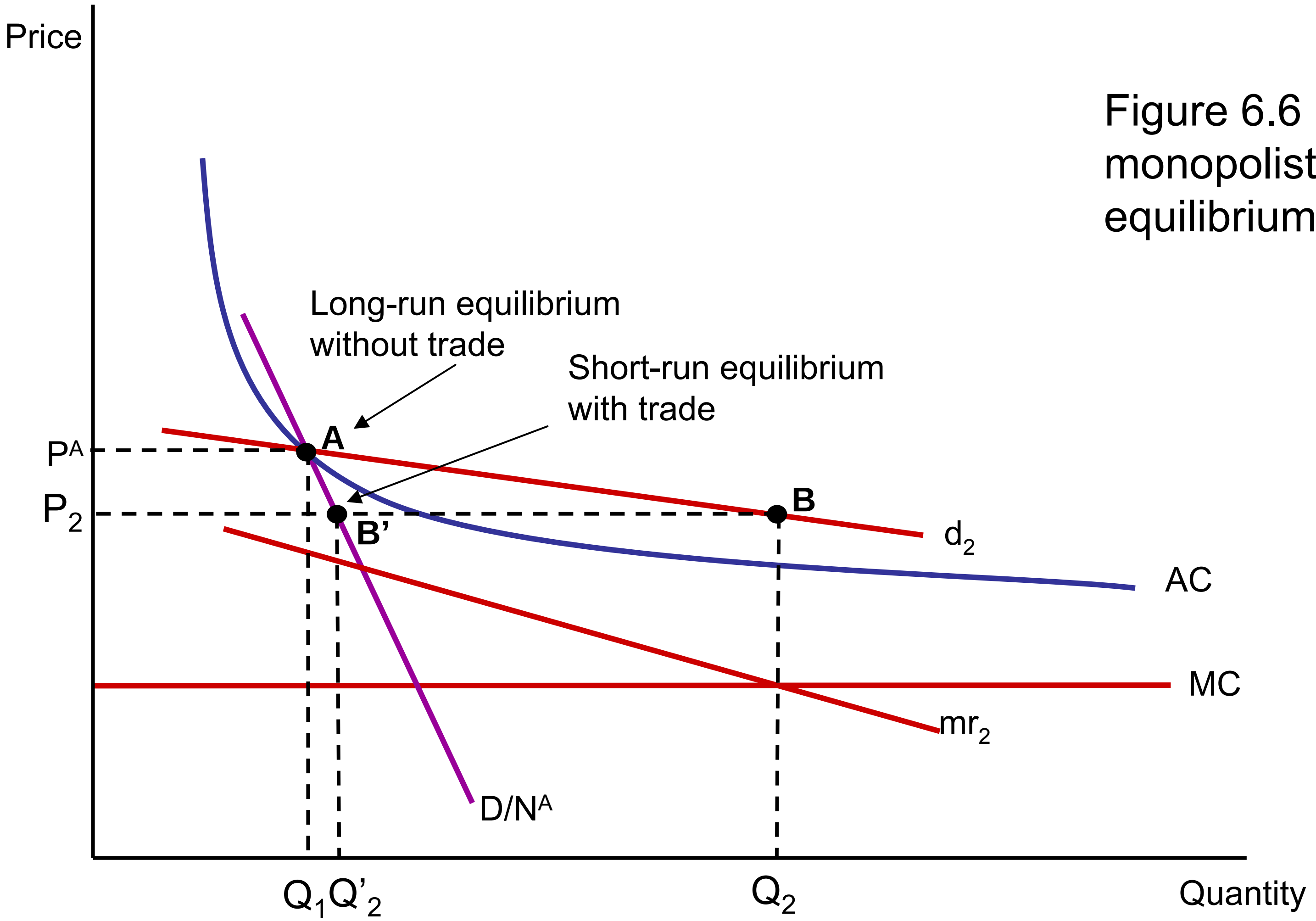


Figure 6.6 Short-run monopolistic competition equilibrium with trade

3. Trade under monopolistic competition

- Long-Run Equilibrium with Trade (figure 6.7)
  - Since firms are making losses, some will go bankrupt and exit industry.
  - Exit will increase demand for remaining firms' products and decrease available product varieties to consumers.
  - We now only have $N^T < N^A$ firms.
  - The new demand D/N^T lies to right of D/N^A.
  - Long-run equilibrium with trade is at point C.
  - Demand for each firm d_3 is tangent to AC.

3. Trade under monopolistic competition

- Long-Run Equilibrium with Trade (cont'd)
  - Even with exit of some firms, world number of products is greater than number available in each country before trade.
  - Demand curve facing each firm after trade is more elastic than before trade.
  - Fewer firms remain in each country, but each is bigger (i.e. there is an increase in quantity sold by each).
  - As quantity increases, average costs fall due to increasing returns to scale, therefore so do prices.

3. Trade under monopolistic competition

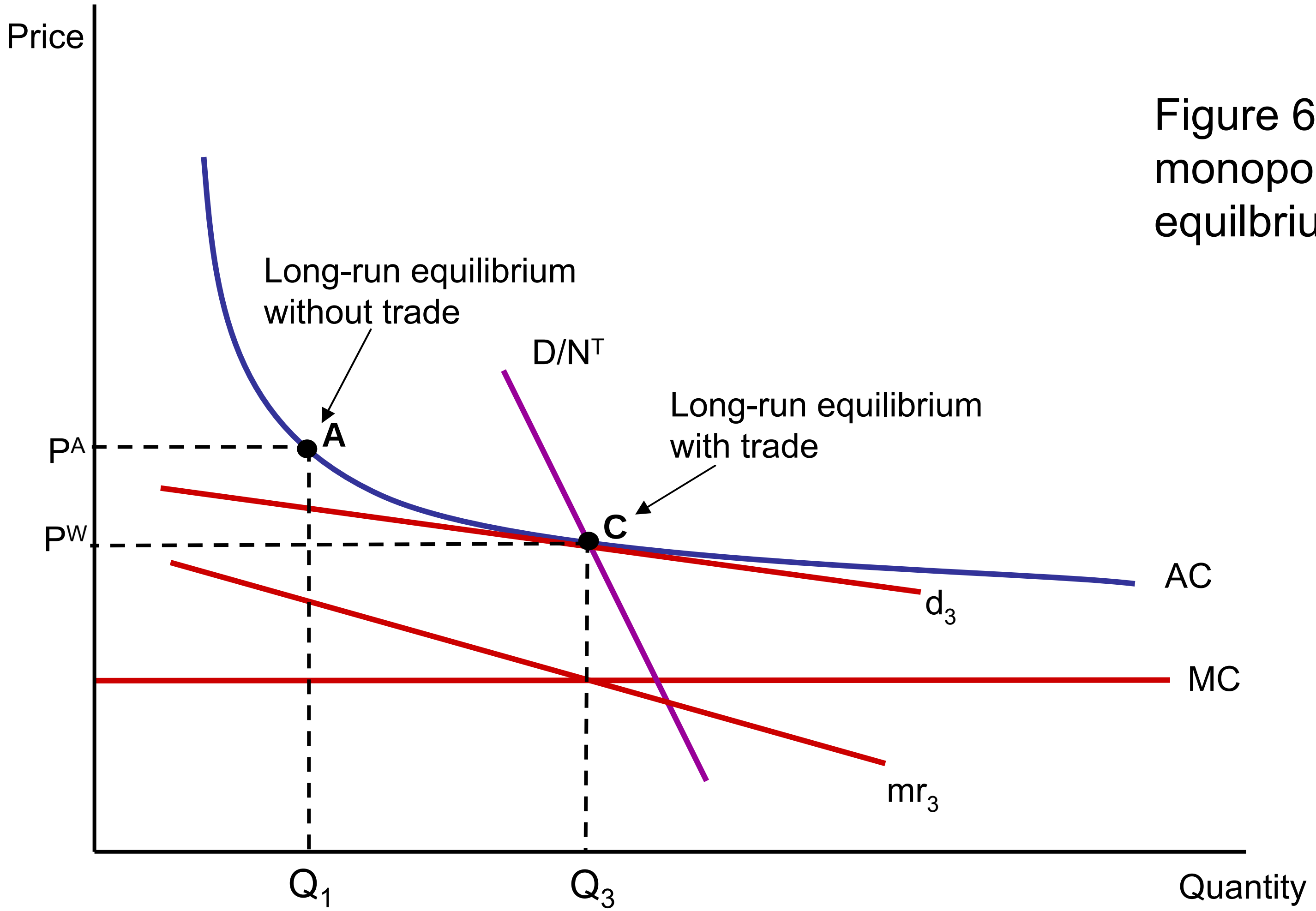


Figure 6.7 Long-run monopolistic competition equilbrium with trade

3. Trade under monopolistic competition

- Gains From Trade
  - Two sources of gains for consumers:
    - Price is lower after trade.
    - Consumers obtain higher surplus when there are more product varieties from which to choose.
  - Gains in overall productivity:
    - Surviving firms improve productivity by taking advantage of IRS to reduce average costs.

3. Trade under monopolistic competition

- Adjustment Costs from Trade
  - Adjustment costs as some firms shut down and exit industry.
  - Workers in those firms experience unemployment.
  - Over long run, workers should find new positions (estimates show avg 3 years unemployment).
  - Empirically compare short-run and long-run adjustment costs:
    - Evidence form Mexico, Canada, and the U.S. under North American Free Trade Agreement (NAFTA).

4. Empirical applications of monopolistic competition and trade

- Idea that free trade expands range of products available to customers already mentioned by Ricardo.
- Ability to model effects of trade under monopolistically competitive model is new.
  - Developed by Helpman, Krugman, and Lancaster.
- Research used to shed light on free trade agreements.

4.1 Empirical applications: NAFTA

The North-American Free Trade Agreement (NAFTA) between Canada, Mexico and the U.S.

- Potential for Canadian firms to expand output was key factor in Canada's free-trade agreement with the U.S. in 1989 and entry into NAFTA (along with Mexico) in 1994.

Gains and Adjustment Costs for Canada

- Studies in Canada as early as the 1960s predicted substantial gains from free trade with U.S.
  - Firms would expand their scale of operations to service larger market and lower costs.
- Studies by Richard Harris in mid-80s influenced Canadian policy makers to proceed with free trade agreement (FTA) with U.S.

4.1 Empirical applications: NAFTA

- Data from 1988–1996 used by Daniel Trefler to estimate effects of Canada-U.S. FTA.
- Some findings:
  - Short-run adjustment costs of 100,000 jobs, or 5% of manufacturing employment.
  - Some industries that had very large tariff cuts saw employment fall by as much as 12%
  - Over time, these job losses were more than made up for by creation of new jobs elsewhere in manufacturing.
  - There were *no long run job losses* due to NAFTA.

4.1 Empirical applications: NAFTA

- In long run, large positive effects on productivity found.
  - 15% over eight years in industries most affected by tariff cuts—compound growth of 1.9%/year.
  - 6% for manufacturing overall—compound growth of 0.7%/year.
  - Difference of 1.2%/year is estimate of how free trade with U.S. affected Canadian industries over and above impact on other industries.
  - Also rise of 3% in real earnings over this period.
- Findings support the monopolistic competition model.

4.1 Empirical applications: NAFTA

Gains and Adjustment Costs for Mexico

- Mexican President Miguel de la Madrid felt that economic reforms were needed to boost growth and incomes in Mexico.
- Joining NAFTA was way to ensure permanence of reforms already underway.
- Under NAFTA, Mexican tariffs on U.S. goods declined from average of 14% in 1990 to 1% in 2001.
- In addition, U.S. tariffs on Mexican imports fell as well.

4.1 Empirical applications: NAFTA

Productivity in Mexico

- Panel A in figure 6.8 shows productivity over time for two types of manufacturing firms:
  - Maquiladora plants—close to border and produce almost exclusively for export to U.S.
  - Non-Maquiladora plants
- Maquiladora plants should be most affected by NAFTA
- Panel B in figure 6.8 shows what happened to real wages and real income over time.

4.1 Empirical applications: NAFTA

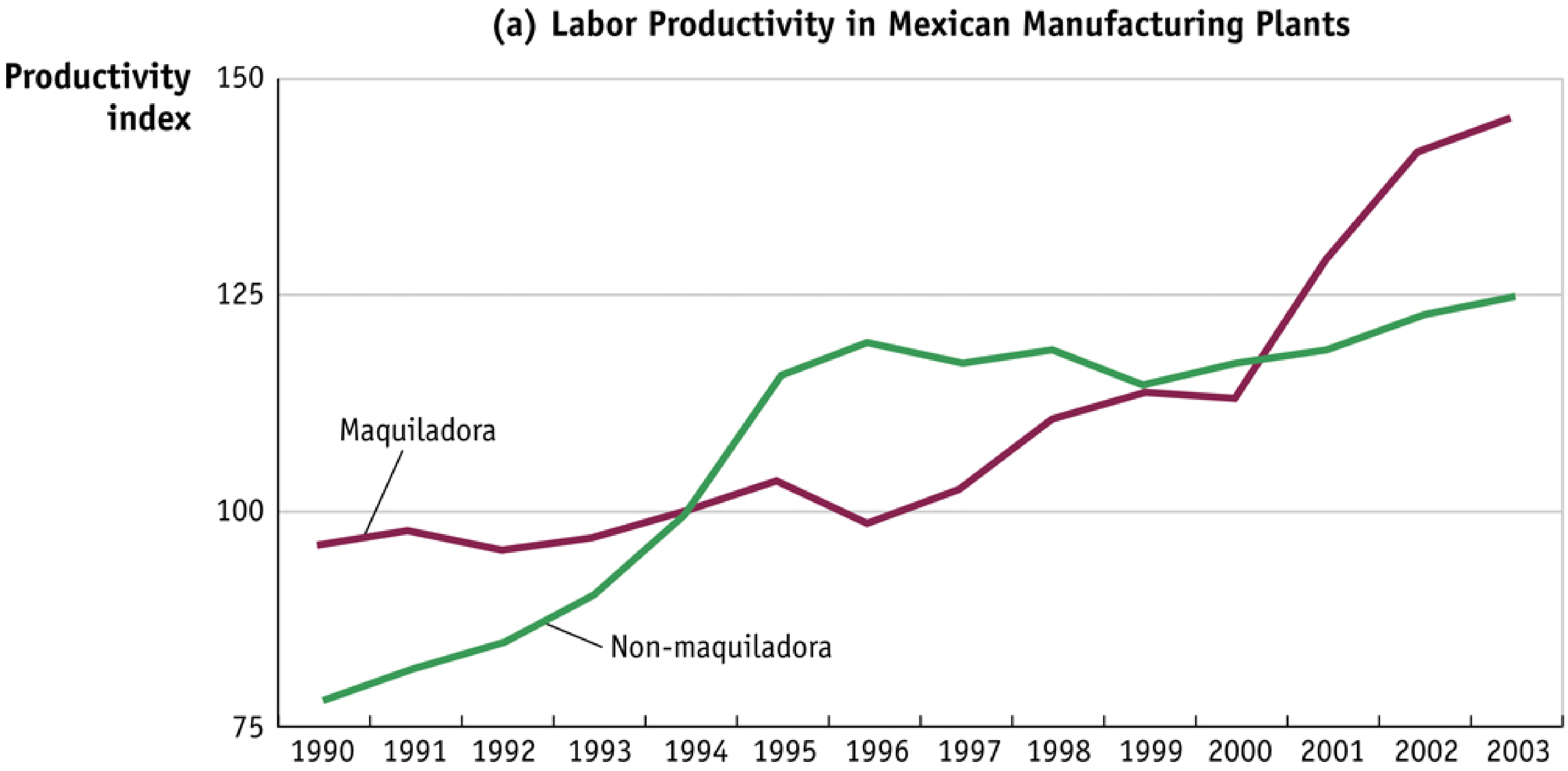


Figure 6.8(a) Labor productivity in Mexican manufacturing plants

4.1 Empirical applications: NAFTA

Productivity in Mexico (cont'd)

- For maquiladora plants, productivity rose 45% from 1994 to 2003—compound growth rate of 4.1%/year.
- For non-maquiladora plants, productivity rose overall by 25%—compound growth rate of 2.5%/year.
- The difference, 1.6%/year, is estimate of impact of NAFTA on productivity of maquiladora plants over and above increase in productivity that occurred in rest of Mexico.

4.1 Empirical applications: NAFTA

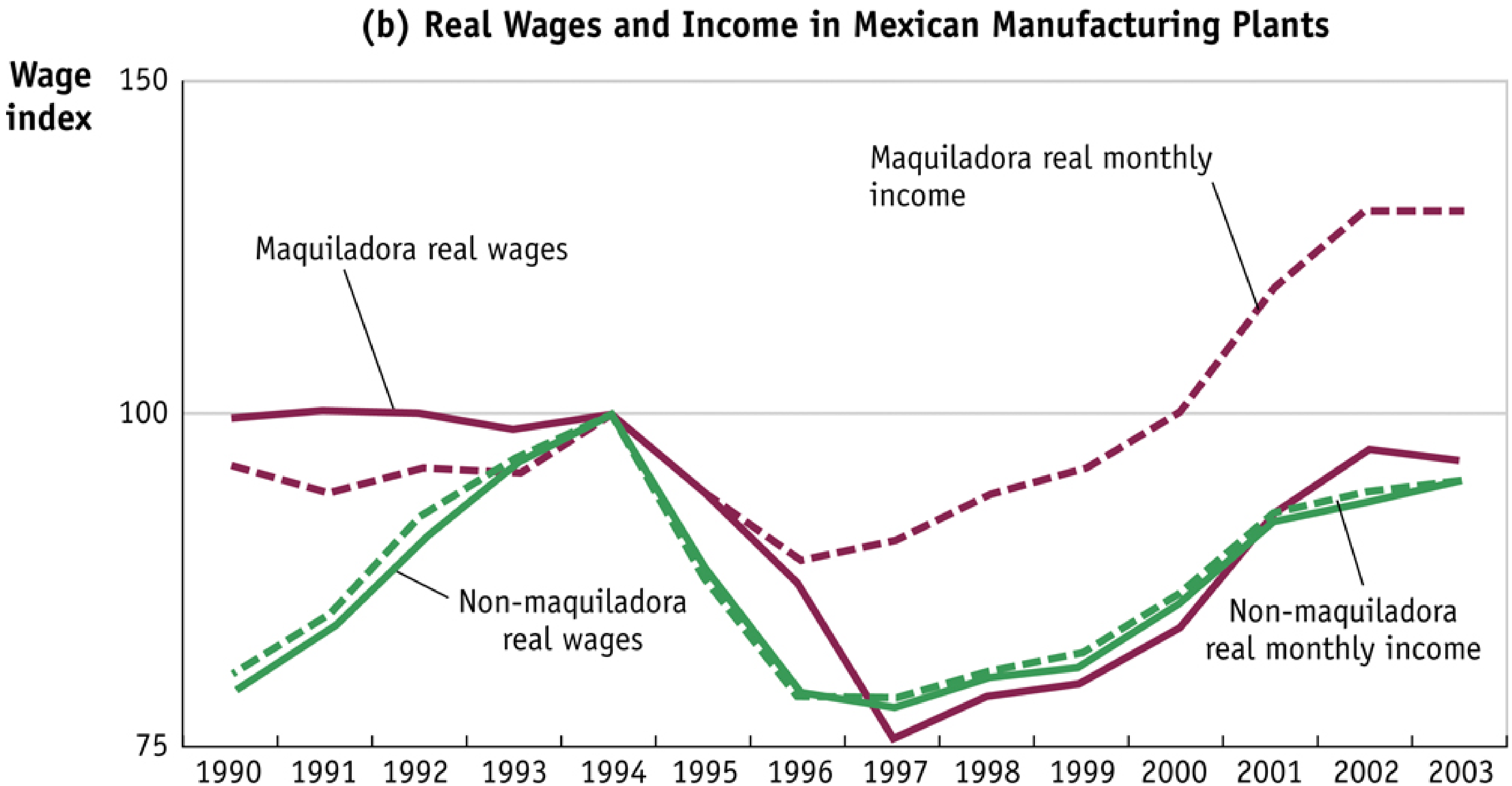


Figure 6.8(b) Real wages and income in Mexican manufacturing plants

4.1 Empirical applications: NAFTA

Real Wages and Income in Mexico

- From 1994 to 1997, fall of over 20% in real wages in both sectors, even with increase in productivity.
- This is not predicted by monopolistic competition model.
  – Shortly after joining NAFTA, Mexico suffered financial crisis that led to large devaluation of peso.

  ➔More expensive for Mexico to import goods.

  ➔Mexican consumer price index also goes up leading to fall in real wages.

4.1 Empirical applications: NAFTA

Real Wages and Income in Mexico (cont'd)

- Maquiladora sector more affected than others by devaluation of peso and did not experience much productivity gain.
- Workers in both areas had to pay higher prices for imported goods.
- Decline in real wages was similar for both sectors.
  - Real wages in both sectors rose again in 1998.
  - By 2003, real wages almost back to 1994 value.
- Real wages not higher than in 1994, so any productivity gains from NAFTA not shared with workers.

4.1 Empirical applications: NAFTA

Real Wages and Income in Mexico (cont'd)

- In terms of real monthly income picture is better.
  - Includes other sources of income beside wages, especially for higher-income persons.
- For non-maquiladora sector, data on real wages and real monthly income move together closely.
- In maquiladora sector, real incomes higher in 2003 than in 1994.
  - Some gains for workers in plants most affected by NAFTA.
- Higher-income workers fared better than unskilled workers in Mexico.
  - Higher-income workers in maquiladora sector are principal gainers due to NAFTA in long run.

4.1 Empirical applications: NAFTA

Adjustment Costs in Mexico

- When Mexico joined NAFTA, expected that agricultural sector would fare worst due to competition from U.S.
  - Tariff reductions in agriculture phased in over 15 years.
- Evidence to date shows corn farmers did not suffer as much as was feared. Why?
  - Poorest farmers consume corn they grow, rather than sell it.
  - Mexican government was able to use subsidies to offset reduction in income for other corn farmers.
- Total production of corn in Mexico rose following NAFTA.

4.1 Empirical applications: NAFTA

Adjustment Costs in Mexico (cont'd)

- For maquiladora plants, employment grew rapidly following NAFTA to peak of 1.29 million in 2000.
- After that, sector entered downturn.
  - U.S. entered recession, decreasing demand for Mexican exports.
  - China competing for U.S. sales by exporting goods similar to those sold by Mexico.
  - Mexican peso became over-valued, making it difficult to export abroad.
- Employment in maquiladora sector fell after 2000 to 1.1 million in 2003.

4.1 Empirical applications: NAFTA

Adjustment Costs in Mexico (cont'd)

- Maquiladora sector faces increasing international competition (not all due to NAFTA).
- This can be expected to raise volatility of its output and employment.
- Volatility can be counted as cost of international trade for workers who are displaced.

4.1 Empirical applications: NAFTA

Gains and Adjustment Costs for the U.S.

- Studies on effects of NAFTA on U.S. have not estimated effects on productivity of U.S. firms.
  – Hard to identify impact since Mexico and Canada are only two of many trading partners.
- Instead, researchers have estimated second source of gains from trade: expansion of import varieties available to consumers.
- For U.S. we will compare long-run gains to consumers due to expanded product varieties with short-run adjustment costs from exiting firms and unemployment.

4.1 Empirical applications: NAFTA

Expansion of Variety to U.S.

- Compare imports from Mexico in 1990 and 2001.
- Table 6.3 shows percentage of all products imported to U.S. in particular industry that are from Mexico.
- Does not take into account amount that Mexico sells of each product, just number of different types of products Mexico sells to U.S. compared to total U.S. imports from all countries.
- From 1990–2000, range of agricultural products that Mexico exported to U.S. expanded from 42% to 51%.
- Export variety grew at faster rate in wood and paper industry, petroleum and plastics, and electronics.

4.1 Empirical applications: NAFTA

Expansion of Variety to U.S. (cont'd)

- Other areas where there had already been a lot of trade, such as machinery and transport, have had slower growth in export variety.
- Expansion in import variety has had same effect as a reduction in import prices of 1.2% per year.
- Increase in variety of products imported to U.S. under NAFTA is source of gains to U.S. consumers.
- According to one estimate, total number of product varieties imported into U.S. from 1972–2001 has increased four times.

4.1 Empirical applications: NAFTA

	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

Table 6.3 Mexico‘s export variety to the U.S. 1990-2001 (in percent)

4.1 Empirical applications: NAFTA

Expansion of Variety to U.S. (cont'd)

- If we use 1.2% equivalent reduction in import prices for Mexico that has been found for all countries, we can estimate some dollar gains.
- Using average $90 billion in U.S. imports per year and 1.2% reduction in prices to U.S. consumers, $90(1.2%) = $1.1 billion per year in savings to consumers.
- *Consumer savings are permanent and increase over time as export varieties grow.*
- In 2003, the 10th year of NAFTA, consumers would gain $11 billion as compared to 1994.

4.1 Empirical applications: NAFTA

Adjustment Costs in U.S.

- Firms exit market due to import competition and workers employed there are temporarily unemployed.
- One way to measure this loss is to look at claims under the U.S. Trade Adjustment Assistance (TAA) provisions.
  - Offers assistance to workers in manufacturing who lose their jobs due to 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 NAFTA-TAA program.

4.1 Empirical applications: NAFTA

Adjustment Costs in U.S. (cont'd)

- Probably most accurate estimate of temporary unemployment caused by NAFTA.
- Compare this number to overall job displacement in the U.S. over same time period.
  - Annual number of workers displaced in manufacturing was 4 million, or 444,000 workers per year.
  - NAFTA layoffs of 58,000 workers were about 13% of total displacement—substantial amount.

4.1 Empirical applications: NAFTA

Adjustment Costs in U.S. (cont'd)

- Alternative: compare loss in wages from displaced workers to consumer gains.
- In chapter 3 we learned that about 2/3 of workers laid off in manufacturing are re-employed within three years.
- Suppose average length of unemployment for laid-off workers is 3 years.
- Average yearly earnings for manufacturing workers was $31,000 in 2000, so each displaced worker lost $93,000 in wages.
- Total losses were $5.4 billion.

4.1 Empirical applications: NAFTA

Adjustment Costs in U.S. (cont'd)

- Private costs of $5.4 billion nearly equal to average welfare gains of $5.5 billion.
- However, gains continue to grow over time and job loss was only temporary.
  - Adjustment costs due to job losses fall.
- In 2002, NAFTA-TAA program was consolidated into general TAA program, so no further data specific to NAFTA.

4.1 Empirical applications: NAFTA

Summary of NAFTA

- (Partly) estimated long-run gains and short-run costs from NAFTA for Canada, Mexico, and U.S.
- Monopolistic competition model indicates two sources of gains from trade, due to rise in productivity from expanded output by surviving firms.
  - Leads to lower prices
  - More varieties of products for consumers
- For Mexico and Canada, long-run gains were measured by improvement in productivity for exporters as compared to other manufacturing firms.

4.1 Empirical applications: NAFTA

Summary of NAFTA (cont'd)

- For U.S., long-run gains estimated by expansion of varieties from Mexico, and equivalent drop in price faced by U.S. consumers.
- Clear that for Canada and U.S., long-run gains considerably exceed short-run costs.
- In Mexico, gains have not been reflected in growth of real wages for production workers.
  - Real earnings for higher-income workers in the maquiladora sector have risen and have been principal beneficiaries of NAFTA so far.

4.2 Empirical applications: Europe

Post-war economic integration: the European Economic Community

- In 1957 the major countries of continental Europe established a free trade area in manufacturing goods, the Common Market or European Economic Community (EEC).
- The result was rapid growth in trade: trade within the EEC grew twice as fast as world trade as a whole during the 1960s.

4.2 Empirical applications: Europe

The ECC (cont'd)

- Single Market reforms of 1992 further liberalized trade by eliminating rules and regulations governing flow of goods within Europe.
- Growth in trade was almost entirely intraindustry rather than interindustry trade, implying that there was no drastic economic dislocation.
- Growth in inter-European trade presented far fewer social and political problems than anticipated, reflecting the theoretical prediction that all factors can win when IRS are a main cause of trade.

4.2 Empirical applications: Europe

New evidence on the gains from trade in Europe

From: Robert Feenstra, R. of World Econon., 2006

- Study deals with three sources of gains from trade that are predicted by models of monopolistic competition:
  - a **fall in prices** due to tariff reductions because of greater competition between firms (closely related to scale economies);
  - **increase in product variety**;
  - **self-selection of firms** with survival of most efficient.

4.2 Empirical applications: Europe

- Survey of empirical evidence for Europe since 1992 Single Market Programme shows:
  - Solid evidence for markup reductions in manufacturing and construction, but not in services. Furthermore, the introduction of the Euro has had additional benefits in the form of an average increase in trade in the range of 8-15% (Baldwin 2006), with indirect (though very small) price reduction effects. Generally, prices have become more similar across countries and trade has grown within the EU area.

4.2 Empirical applications: Europe

- No direct empirical evidence for Europe yet on gains from trade from increased product variety, but they are likely to be similar to those recently estimated for the U.S. by Broda & Weinstein (2006), i.e. gains from trade due to increased import variety of around 2.6 percent of GDP in 2001! (Feenstra expects results to be even higher for internal EU trade because of higher trade to GDP ratio).

4.2 Empirical applications: Europe

– Recent studies for France have shown that only a small fraction of firms in any industry produce for the export market, but these firms account for very large share of total sales in industry. Implication is that these firms are more productive than other firms, confirming theory which predicts that after trade liberalization least efficient firms will exit market, more efficient firms will expand foreign sales, while those in the mid-range of efficiency will concentrate on domestic sales. Similar findings as for U.S. and Canada.

4.3 Empirical applications: Intra-Industry Trade

Intra-Industry Trade

- Under monopolistic competition, countries will specialize in producing different varieties of a differentiated good and will trade those varieties back and forth.
- As with golf clubs, this common trade pattern is called **intra-industry trade.**
- Index of intra-industry trade shows proportion of trade in each product involving both imports and exports.

4.3 Empirical applications: Intra-Industry Trade

Index of Intra-Industry Trade

- A high index, up to 100%, indicates that equal amount of good is imported and exported.
  - For high index, good must be differentiated and costs similar in Home and Foreign, leading to both imports and exports.
- A low index, 0%, indicates that good is either imported or exported, but not both.
- The formula for the index is:

$$Index\ of\ IIT = \frac{Min\ of\ Imports\ \&\ Exports}{\frac{1}{2}\left(Exports - Imports\right)}$$

4.3 Empirical applications: Intra-Industry Trade

Product	Value of Imports ($ millions)	Value of Exports ($ millions)	Index of Intra-industry Trade (%)
Golf clubs	$305.8	$318.7	98%
Vaccines	799.1	605.2	86
Small cars	1,199.0	800.9	80
Whiskey	757.7	481.7	78
Mattresses	89.8	32.4	53
Large passenger aircraft	5,988.2	18,821.5	48
Frozen orange juice	223.0	64.0	45
Apples	102.8	492.7	35
Sunglasses	835.4	105.7	22
Natural gas	27,134.5	2,802.8	19
Fax machines	271.8	15.2	11
Men's shorts	701.3	12.1	3

Table 6.4 Index of intra-industry trade for the U.S., 2005

4.3 Empirical applications: Intra-Industry Trade

Intraindustry trade and scale economies: the North American Auto Pact of 1964

(From: Krugman & Obstfeld (2006), chapter 6)

Before 1965, tariff protection by Canada and the United States produced a Canadian auto industry that was largely self-sufficient, neither importing nor exoprting much. The Canadian industry was controlled by the same firms as the U.S. industry, but these firms found it cheaper to have largely separate production systems than to pay the tariffs. Thus, the Canadian industry was in effect a miniature version of the U.S. industry, at about 1/10th the scale.

The Canadian subsidiaries of U.S. firms found that small scale was a substantial disadvantage. This was partly because Canadian plants had to be smaller than their U.S. counterparts. Perhaps more important, U.S. plants could often be "dedicated" – i.e. devoted to producing a single model or component – while Canadian plants had to produce several different things, requiring the plants to shut down periodically to change over from producing one item to producing another, to hold larger inventories, to use less specialized machinery, etc. The Canadian auto industry had a labor productivity about 30 percent lower than that of the United States.

4.3 Empirical applications: Intra-Industry Trade

In an effort to remove these problems, the United States and Canada agreed in 1964 to establish a free trade area in automobiles (subject to certain restrictions). This allowed the auto companies to reorganize their production. Canadian subsidiaries of the auto firms sharply cut the number of products made in Canada. For example, General Motors cut in half the models assembled in Canada.

The overall level of Canadian production and employment was, however, maintained. This was achieved by importing from the United States products no longer made in Canada and exporting products Canada continued to make. In 1962, Canada exported $16 million worth of automotive products to the U.S. while importing $519 million worth. By 1968 the numbers were $2.4 and $2.9 billion, respectively! In other words, both exports and imports increased sharply due to intraindustry trade.

The gains seem to have been substantial. By the early 1970s the Canadian industry was comparable to the U.S. industry in productivity.

4.4 Empirical applications: Gravity Equation

The Gravity Equation

- Gravity equation explains value of trade.
- Dutch economist/physicist and Nobel laureate Jan Tinbergen thought trade between countries was similar to force of gravity between objects.
  - Objects with larger mass or those that are close together have greater gravitational pull between them.
- Gravity equation for trade states that countries with larger GDPs or that are close to each other will have more trade between them.

4.4 Empirical applications: Gravity Equation

Newton's Universal Law of Gravitation

- Suppose you have two objects with masses M_1 and $M_{2,}$, that are located distance d apart.
- Force of gravity between two masses is:

$$F_g = G[M_1M_2/d^2]$$

  - G is constant that tells magnitude of relationship.
  - The larger the objects are or the closer, the greater the force of gravity between them.

4.4 Empirical applications: Gravity Equation

Gravity Equation in Trade

- Similar equation to measure trade between two countries.
- Instead of mass, use GDP of each country.
- Distance *dist* still matters, but not squared because we are not sure of precise relationship between distance and trade.
- Constant term indicates relationship between gravity term and trade.

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

4.4 Empirical applications: Gravity Equation

Gravity Equation in Trade (cont'd)

- Constant term can be interpreted as summarizing effects of all factors, other than distance and size, that influence amount of trade between two countries.
- The larger the two countries are or the closer they are, the greater the amount of trade.
- Implication of monopolistic competition model:
  - Larger countries export more because they produce more product varieties, and import more because their demand is higher.

4.4 Empirical applications: Gravity Equation

Deriving the Gravity Equation

- Start with Country 1 with GDP_1 which produces a differentiated product.
- Other countries demand Country 1's goods and the amount they demand depends on:
  – The relative size of the importing country
  – The distance between the two countries
- To measure relative size, use its share of world GDP.
  – $Share_2 = GDP_2/GDP_w$

4.4 Empirical applications: Gravity Equation

Deriving the Gravity Equation (cont'd)

- Exports from Country 1 to Country 2 will equal goods available in Country 1 times relative size of country 2, divided by transportation costs:

$$Trade = \frac{GDP_1 Share_2}{dist^n} = \frac{1}{GDP_W} \frac{GDP_1 GDP_2}{dist^n}$$

- Similar to Newton's gravity equation.
- $1/GDP_W$ is constant term.

4.4 Empirical applications: Gravity Equation

- Figure 6.9 shows data collected on value of trade between Canadian provinces and U.S. states in 1993.
- Exponent of 1.25 is used on distance variable based on other research studies.
- Horizontal axis is gravity equation on logarithmic scale.
  - Higher value means either large GDP for trading province and state or smaller distance between them.
- Vertical axis shows 1993 value of exports between a Canadian province and U.S. state or vice versa on logarithmic scale.

4.4 Empirical applications: Gravity Equation

- Each of the points in panel A represents trade flow and gravity term between one state and one province.
- A pair with a high gravity term also has more trade.
  ➔ supports gravity equation theory.
- We can also estimate best fit line through data points which gives constant term of 93.
  - When gravity term equals 1, then the predicted amount of trade between that state and province is $93 million.

4.4 Empirical applications: Gravity Equation

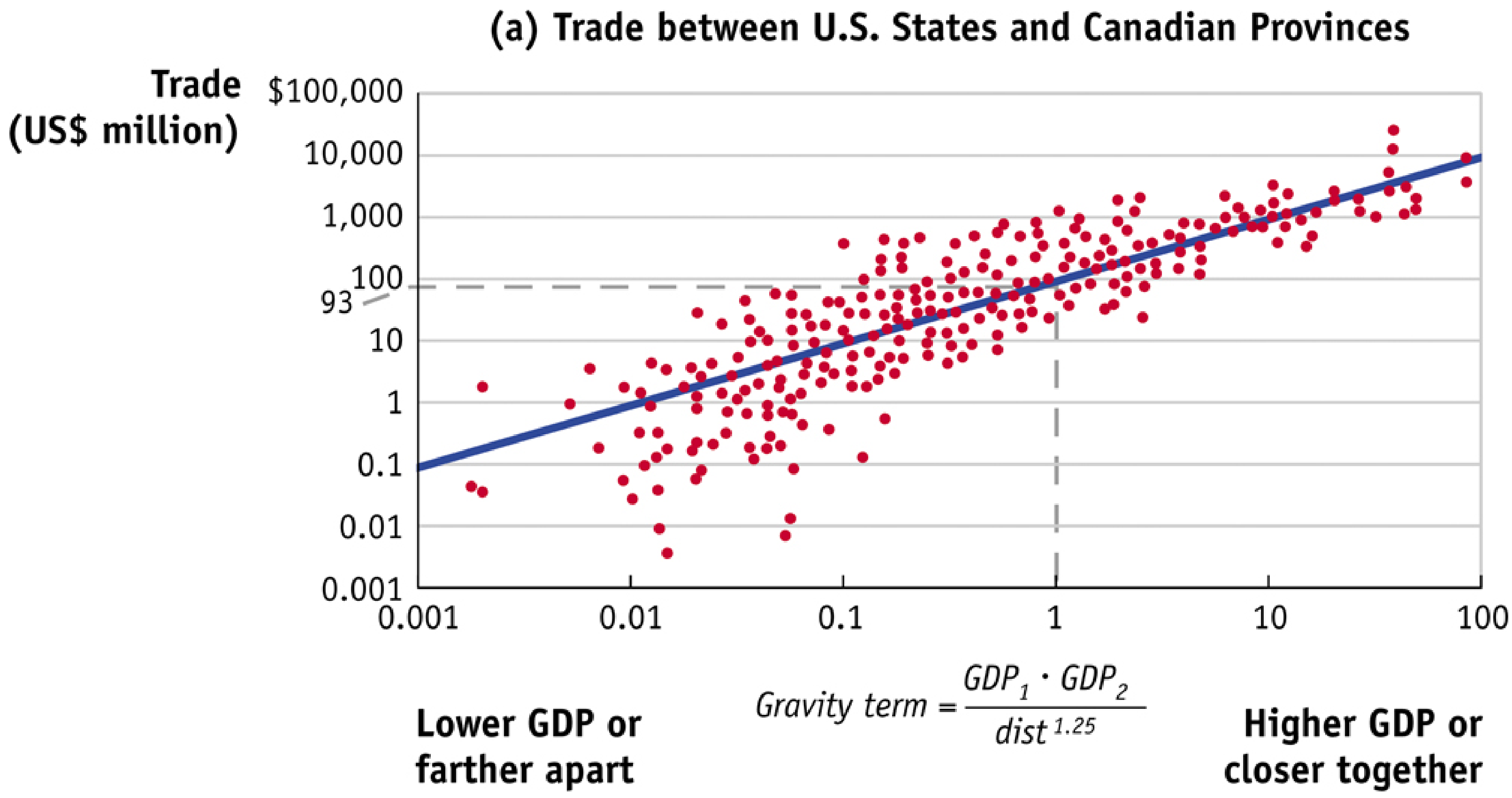


Figure 6.9(a) Trade between U.S. states and Canadian provinces

4.4 Empirical applications: Gravity Equation

- Gravity equation also works well for predicting trade within a country, or intra-national trade.
- Panel B of figure 6.9 graphs value of exports and gravity term between any two Canadian provinces.
- Strong positive relationship between gravity term between two provinces and their trade.
- The best fit line gives a constant term of 1300.
  - When gravity term is 1, the predicted amount of trade is $1.3 billion.

4.4 Empirical applications: Gravity Equation

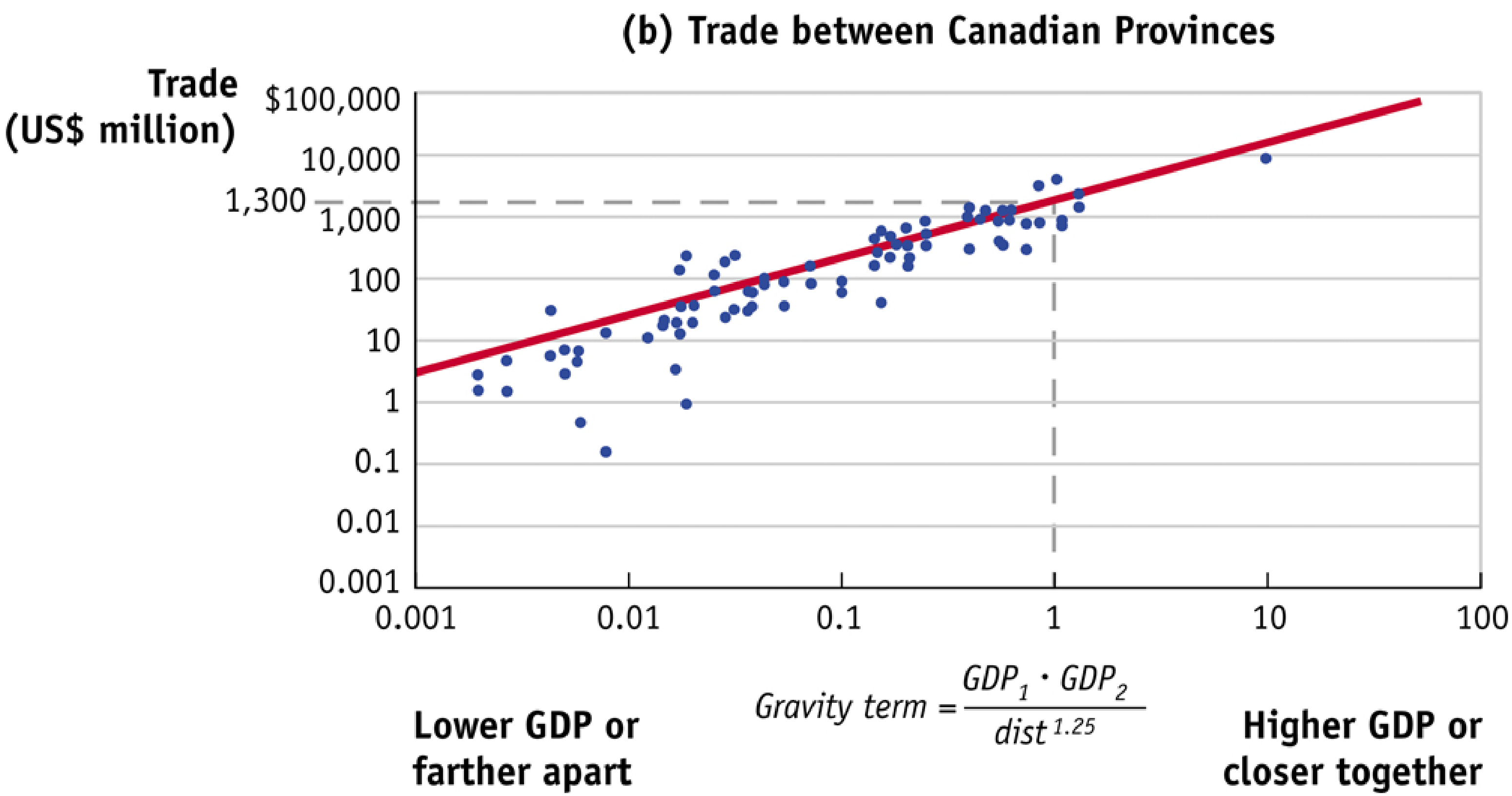


Figure 6.9(b) Trade between Canadian provinces

4.4 Empirical applications: Gravity Equation

- Taking ratio of constant terms (1300/93 = 14) means on average there is 14 times more trade within Canada than occurs across the border.
- Number is even higher if we consider an earlier year before the free trade agreement.
  - In 1988, intra-national trade within Canada was 22 times higher.
- High amount of trade within Canada reflects the barriers to trade that occur between countries.

4.5 Empirical applications: Movie Industry Economics

From: Krugman & Obstfeld (2006), chapter 6

What is the United States' most important export sector?

The answer depends to some extent on definitions and could be agriculture or aircraft. However, by any measure one of the biggest exporters in the U.S. is the entertainment sector, movies in particular. Since 1994, American movie companies have been receiving over half of their box office receipts from overseas sales. In 2000, rental fees generated by exports of films and tape were $8.9 billion – more than domestic box office receipts. American films dominated ticket sales in much of the world, accounting for 82 percent of box office receipts in Germany, 65 percent in Japan, and 58 percent in France.

Why is the United States the world's dominant exporter of entertainment? There are important advantages arising from the sheer size of the American market. A film aimed primarily at the French or Italian markets, which are of course far smaller than that of the U.S., cannot justify the huge budgets of many American films. Thus, films from these countries are typically dramas or comedies whose appeal often fails to survive dubbing or subtitles.

4.5 Empirical applications: Movie Industry Economics

Meanwhile, American films can transcend the language barrier with lavish productions and spectacular special effects. [Of course, Hollywood movies typically also have much larger advertisement budgets than smaller productions.]

However, an important part of the American dominance in the industry also comes from the external economies created by the immense concentration of entertainment firms in Hollywood. Hollywood clearly generates two of the three types of external economies we have seen: specialized suppliers and labor market pooling. While the final product is provided by movie studios and television networks, these in turn draw on a complex web of independent producers, casting and talent agencies, legal firms, special effects experts, etc.

And the need for labor market pooling is obvious to anyone who has watched the credits at the end of a movie: each production requires a huge but temporary army that includes cameramen, makeup artists, musicians, stunt men and women, gaffers, grips….and actors and actresses, of course.

4.5 Empirical applications: Movie Industry Economics

Whether it also generates the third kind of external economies – knowledge spillovers – is less certain. If there is any knowledge to spill over, surely it does so better in the intense social environment of Hollywood than it could elsewhere.

An indication of the force of Hollywood's external economies has been its persistent ability to draw talent from outside the U.S. from Garbo to Bergman and Schwarzenegger and Forster, "American" films have often been made by ambitious foreigners who moved to Hollywood – and in the end reached a larger audience even in their original nations than they could have if they had remained at home.

4.5 Empirical applications: Movie Industry Economics

Is Hollywood unique? No, similar forces have led to emergence of several other entertainment complexes.

In India, whose film market has been protected from American domination partly by government policy and partly by cultural differences, a movie-making cluster known as “Bollywood” has emerged in Mumbai [and has apparently surpassed Hollywood in size].

A substantial film industry catering to Chinese speakers has emerged in Hong Kong. And a specialty industry producing Spanish-language *telenovelas* for television programs all over Latin America has emerged in Caracas, Venezuela. This last entertainment complex has discovered some unexpected export markets: television viewers in Russia, it turns out, identify more readily with the characters in Latin American soap operas than with those in U.S. productions.

4.6 Lessons from empirical studies on IRS and gains from trade

- Large part of world trade is intra-industry trade (IIT), which cannot be explained through comparative advantage. Instead, it reflects economies of scale.
- IIT varies across goods: chemicals, computers, industrial machinery, and precision instruments tend to have percentage of IIT in highly developed economies; all of these products are subject to technological differentiation and scale economies. IIT is relatively small in most countries for clothing and fuels, indicating that trade in these sectors is largely driven by comparative advantage.

4.6 Lessons from empirical studies on IRS and gains from trade

- There is empirical evidence for gains from trade due to scale economies: increased trade tends to reduce price markups and increase production.
- In addition, trade also leads to increased product variety and a reduction in the number of firms, with an increase in overall productivity and the most efficient firms exporting part of their products. Both factors lead to gains from trade and are in line with theoretical predictions.
- Much empirical work remains to be done: in particular, it is difficult to distinguish gains from trade from other sources of welfare or productivity increases and to distinguish the exact causes of these gains.

5. Conclusions

- When firms have differentiated products and increasing returns to scale, there is potential for gains from trade above and beyond what we saw in Ricardian, Specific-factors and HO models.
- Model of monopolistic competition shows trade will occur even between countries that are identical, because potential to sell in a larger market will induce firms to lower prices below those charged in absence of trade.
- Reduction in average costs lowers prices charged by firms, creating gains for consumers in importing country.

5. Conclusions

- Additionally, since each firm produces a differentiated product, trade between countries allows for more product varieties available for consumers.
- Since some firms exit the market, there are short-run adjustment costs due to worker displacement.
- Using model from NAFTA, we saw that short-run adjustment costs are less than long-run gains.
- "Gravity equation" states that countries that are larger or closer to each other will trade more, which is supported by data.

5. Conclusions

- *Additional note*: when products are homogeneous, it is still possible to get two-way trade between countries.
  - This leads to price dumping.
- Dumping arises due to a more elastic demand curve in the export market.
- Dumping can also occur even when demand curves in the two markets are the same, as firms compete to enter each other's markets.
- When firms in both countries act this way they are engaged in reciprocal dumping.