International Finance Theory and Policy 11th edition Krugman Solutions Manual

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Chapter 2

World Trade: An Overview

■ Chapter Organization

Who Trades with Whom?

Size Matters: The Gravity Model.

Using the Gravity Model: Looking for Anomalies.

Impediments to Trade: Distance, Barriers, and Borders.

The Changing Pattern of World Trade.

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Summary

■ Chapter Overview

Before entering into a series of theoretical models that explain why countries trade across borders and the benefits of this trade (Chapters 3–12), Chapter 2 considers the pattern of world trade that we observe today. The core idea of the chapter is the empirical model known as the gravity model. The gravity model is based on the observations that (1) countries tend to trade with nearby economies and (2) trade is proportional to country size. The model is called the *gravity model,* as it is similar in form to the physics equation that describes the pull of one body on another as proportional to their size and distance.

The basic form of the gravity equation is $T_{ij} = A \times Y_i \times Y_j/D_{ij}$. The logic supporting this equation is that

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large countries have large incomes to spend on imports and produce a large quantity of goods to sell as exports. This means that the larger that either trade partner is, the larger the volume of trade between them. At the same time, the distance between two trade partners can substitute for the transport costs that they face as well as proxy for more intangible aspects of a trading relationship such as the ease of contact for firms. This model can be used to estimate the predicted trade between two countries and look for anomalies in trade patterns. The text shows an example where the gravity model can be used to demonstrate the importance of national borders in determining trade flows. According to many estimates, the border between the United States and Canada has the impact on trade equivalent to roughly 1,500–2,500 miles of distance. Other factors such as tariffs, trade agreements, and common language can all affect trade and can be incorporated into the gravity model.

The chapter also considers the way trade has evolved over time. Although people often feel that globalization in the modern era is unprecedented, in fact, we are in the midst of the second great wave of globalization. From the end of the 19th century to World War I, the economies of different countries were quite connected, with trade as a share of GDP higher in 1910 than in 1960. Only recently have trade levels surpassed pre–World War I trade. The nature of trade has changed, though. The majority of trade is in manufactured goods with agriculture and mineral products making up less than 20% of world trade. Even developing countries now primarily export manufactures. A century ago, more trade was in primary products as nations tended to trade for things that literally could not be grown or found at home. Today, the motivations for trade are varied, and the products we trade are increasingly diverse. Despite increased complexity in modern international trade, the fundamental principles explaining trade at the dawn of the global era still apply today. The chapter concludes by focusing on one particular expansion of what is "tradable"—the increase in services trade. Modern information technology has expanded greatly what can be traded as the person staffing a call center, doing your accounting, or reading your X-ray can literally be halfway around the world. Although service outsourcing is still relatively rare, the potential for a large increase in service outsourcing is an important part of how trade will evolve in the coming decades. The next few chapters will explain the theory of why nations trade.

■ Answers to Textbook Problems

1. We saw that not only is GDP important in explaining how much two countries trade, but also, distance is crucial. Given its remoteness, Australia faces relatively high costs for transporting imports and exports, thereby reducing the attractiveness of trade. Because Canada has a border with a large

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economy (the United States) and Australia is not near any other major economy, it makes sense that Canada would be more open and Australia more self-reliant.

2. Mexico is quite close to the United States, but it is far from the European Union (EU), so it makes sense that it trades largely with the United States. Brazil is far from both, so its trade is split between the two. Mexico trades more than Brazil in part because it is so close to a major economy (the United States) and in part because it is a member of a trade agreement with a large economy (NAFTA). Brazil is farther away from any large economy and is in a trade agreement with relatively small countries.

3. No, if every country's GDP were to double, world trade would not quadruple. Consider a simple example with only two countries: A and B. Let country A have a GDP of $6 trillion and B have a GDP of $4 trillion. Furthermore, the share of world spending on each country's production is proportional to each country's share of world GDP (stated differently, the exponents on GDP in Equation 2-2, *a* and *b,* are both equal to 1). Thus, our example is characterized by the table below:

Country	GDP	Share of World Spending
A	$6 trillion	60%
B	$4 trillion	40%

Now let us compute world trade flows in this example. Country A has an income of $6 trillion and spends 40% of that income on country B's production. Thus, exports from country B to country A are equal to $6 trillion × 40% = $2.4 trillion. Country B has an income of $4 trillion and spends 60% of this on country A's production. Thus, exports from country A to country B are equal to $4 trillion × 60% = $2.4 trillion. Total world trade in this simple model is $2.4 + $2.4 = $4.8 trillion.

What happens if we double GDP in both countries? Now GDP in country A is $12 trillion, and GDP in country B is $8 trillion. However, the share of world income (and spending) in each country has not changed. Thus, country A will still spend 40% of its income on country B products, and country B will still spend 60% of its income on country A products. Exports from country B to country A are equal to $12 trillion × 40% = $4.8 trillion. Exports from country A to country B are $8 trillion × 60% = $4.8 trillion. Total trade is now equal to $4.8 + $4.8 = $9.6 trillion. Looking at trade before and after the doubling of GDP, we see that total trade actually doubled, not quadrupled.

4. As the share of world GDP that belongs to East Asian economies grows, then in every trade relationship that involves an East Asian economy, the size of the East Asian economy has grown. This makes the trade relationships with East Asian countries larger over time. The logic is similar to why the countries trade more with one another. Previously, they were quite small economies,

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meaning that their markets were too small to import a substantial amount. As they became wealthier and the consumption demands of their populace rose, they were each able to import more. Thus, while they previously had focused their exports to other rich nations, over time they became part of the rich nation club and thus were targets for one another's exports. Again, using the gravity model, when South Korea and Taiwan were both small, the product of their GDPs was quite small, meaning that despite their proximity, there was little trade between them. Now that they have both grown considerably, their GDPs predict a considerable amount of trade.

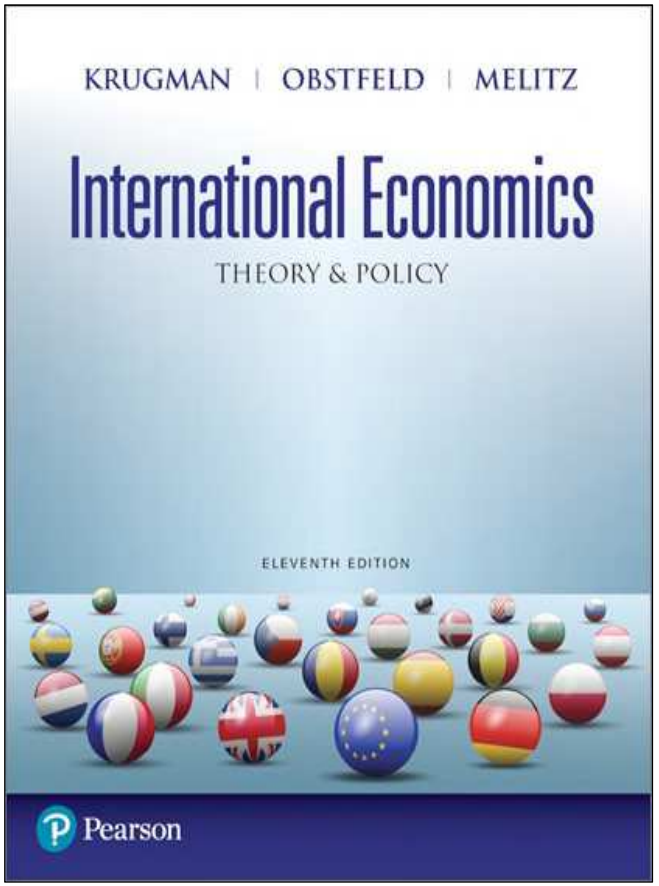
5. As the chapter discusses, a century ago much of world trade was in commodities, which were in many ways climate or geography determined. Thus, the United Kingdom imported goods that it could not make itself. This meant importing things like cotton or rubber from countries in the Western Hemisphere or Asia. As the United Kingdom's climate and natural resource endowments were fairly similar to those of the rest of Europe, it had less of a need to import from other European countries. In the aftermath of the Industrial Revolution, where manufacturing trade accelerated and has continued to expand with improvements in transportation and communications, it is not surprising that the United Kingdom would turn more to the nearby and large economies in Europe for much of its trade. This result is a direct prediction of the gravity model.

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International Economics: Theory and Policy

Eleventh Edition



Chapter 2

World Trade: An Overview

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Learning Objectives

2.1 Describe how the value of trade between any two countries depends on the size of these countries' economies and explain the reasons for that relationship.

2.2 Discuss how distance and borders reduce trade.

2.3 Describe how the share of international production that is traded has fluctuated over time and why there have been two ages of globalization.

2.4 Explain how the mix of goods and services that are traded internationally has changed over time.

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Preview

- Largest trading partners of the United States
- Gravity model: Influence of an economy's size on trade; Distance, barriers, borders and other trade impediments
- Globalization: then and now
- Changing composition of trade
- Service outsourcing

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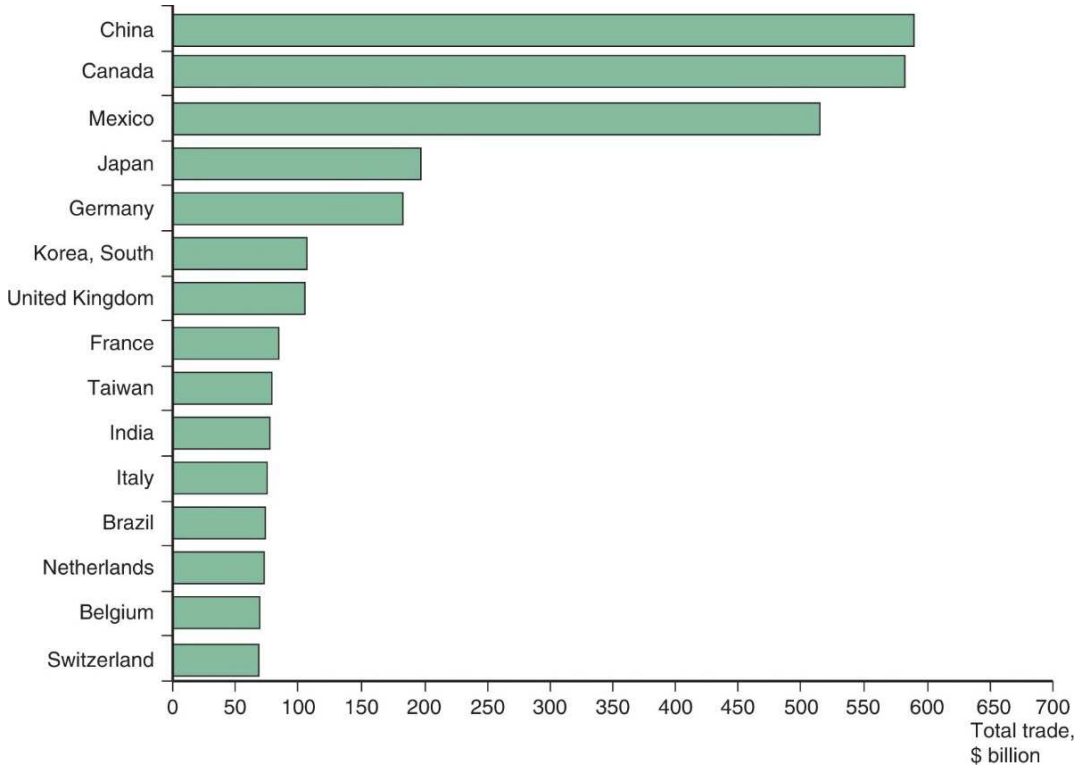
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Who Trades with Whom?

- More than 30% of world output is sold across national borders.
  - World trade in goods and services exceeded $21 trillion in 2015.
- The 5 largest trading partners with the U.S. in 2015 were China, Canada, Mexico, Japan, and Germany.
- The largest 15 trading partners with the U.S. accounted for 75% of the value of U.S. trade in 2015.

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Figure 2.1 Total U.S. Trade with Major Partners, 2015



U.S. trade—measured as the sum of imports and exports—is mostly with 15 major partners.

Source: U.S. Department of Commerce.

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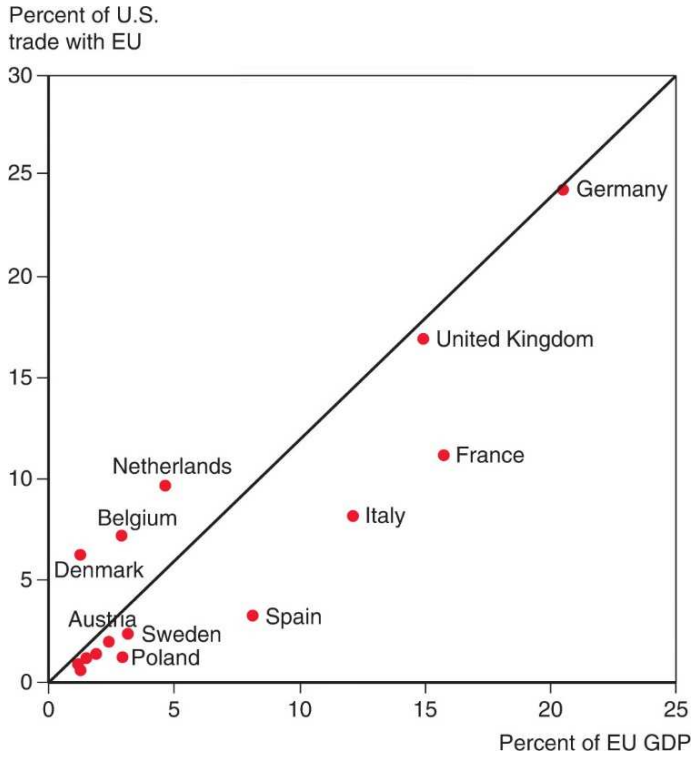
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Size Matters: The Gravity Model (1 of 3)

- 3 of the top 10 trading partners with the U.S. in 2012 were also the 3 largest European economies: Germany, the United Kingdom, and France.
- Why does the United States trade more with these European countries than with others?
  - These countries have the largest **gross domestic product (GDP)**, the value of goods and services produced in an economy, in Europe.
  - Each European country's share of U.S. trade with Europe is roughly equal to its share of European GDP.

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Figure 2.2 The Size of European Economies, and the Value of Their Trade with the United States



Shows the correspondence between the size of different European economies and those countries' trade with the United States.

Source: U.S. Department of Commerce, European Commission.

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Size Matters: The Gravity Model (2 of 3)

- The size of an economy is directly related to the volume of imports and exports.
  - Larger economies produce more goods and services, so they have more to sell in the export market.
  - Larger economies generate more income from the goods and services sold, so they are able to buy more imports.
- Trade between any two countries is larger, the larger is either country.

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Size Matters: The Gravity Model (3 of 3)

- The gravity model assumes that size and distance are important for trade in the following way:

$$T_{ij} = \frac{A \times Y_i \times Y_j}{D_{ij}}$$

where A is a constant term

T_{ij} is the value of trade between country *i* and country *j*

Y_i the GDP of country *I*, Y_j is the GDP of country *j*

D_{ij} is the distance between country *i* and country *j*

- Or more generally $T_{ij} = \frac{A \times Y_i^a \times Y_j^b}{D_{ij}^c}$

where *a, b,* and *c* are allowed to differ from 1.

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Using the Gravity Model: Looking for Anomalies

- A gravity model fits the data on U.S. trade with European countries well but not perfectly.
- The Netherlands, Belgium and Ireland trade much more with the United States than predicted by a gravity model.
  - Ireland has strong cultural affinity due to common language and history of migration.
  - The Netherlands and Belgium have transport cost advantages due to their location.

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Impediments to Trade: Distance, Barriers, and Borders (1 of 4)

Other things besides size matter for trade:

1. **Distance** between markets influences transportation costs and therefore the cost of imports and exports.
2. **Cultural affinity:** close cultural ties, such as a common language, usually lead to strong economic ties.
3. **Geography:** ocean harbors and a lack of mountain barriers make transportation and trade easier.
4. **Multinational corporations:** corporations spread across different nations import and export many goods between their divisions.
5. **Borders:** crossing borders involves formalities that take time, often different currencies need to be exchanged, and perhaps monetary costs like tariffs reduce trade.

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Impediments to Trade: Distance, Barriers, and Borders (2 of 4)

- Estimates of the effect of distance from the gravity model predict that a 1% increase in the distance between countries is associated with a decrease in the volume of trade of 0.7% to 1%.
- Besides distance, borders increase the cost and time needed to trade.
- **Trade agreements** between countries are intended to reduce the formalities and tariffs needed to cross borders, and therefore to increase trade.

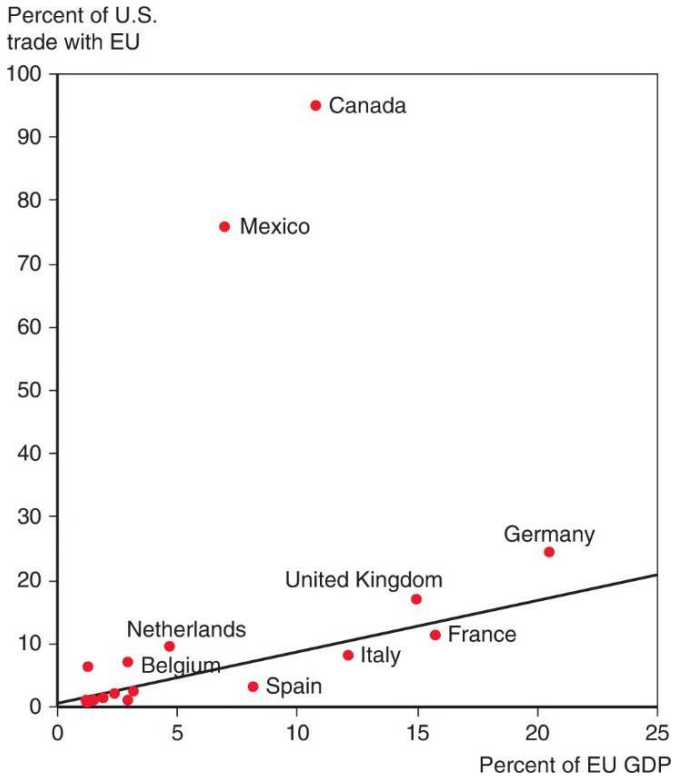
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Impediments to Trade: Distance, Barriers, and Borders (3 of 4)

- The U.S. signed a free trade agreement with Mexico and Canada in 1994, the North American Free Trade Agreement (NAFTA).
- Because of NAFTA and because Mexico and Canada are close to the U.S., the amount of trade between the U.S. and its northern and southern neighbors as a fraction of GDP is larger than between the U.S. and European countries.
  - Canada's economy is roughly the same size as Spain's (around 10% of EU GDP) but Canada trades as much with the United States as does all of Europe.

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Figure 2.3 Economic Size and Trade with the United States



The United States does markedly more trade with its neighbors than it does with European economies of the same size.

Source: U.S. Department of Commerce, European Commission.

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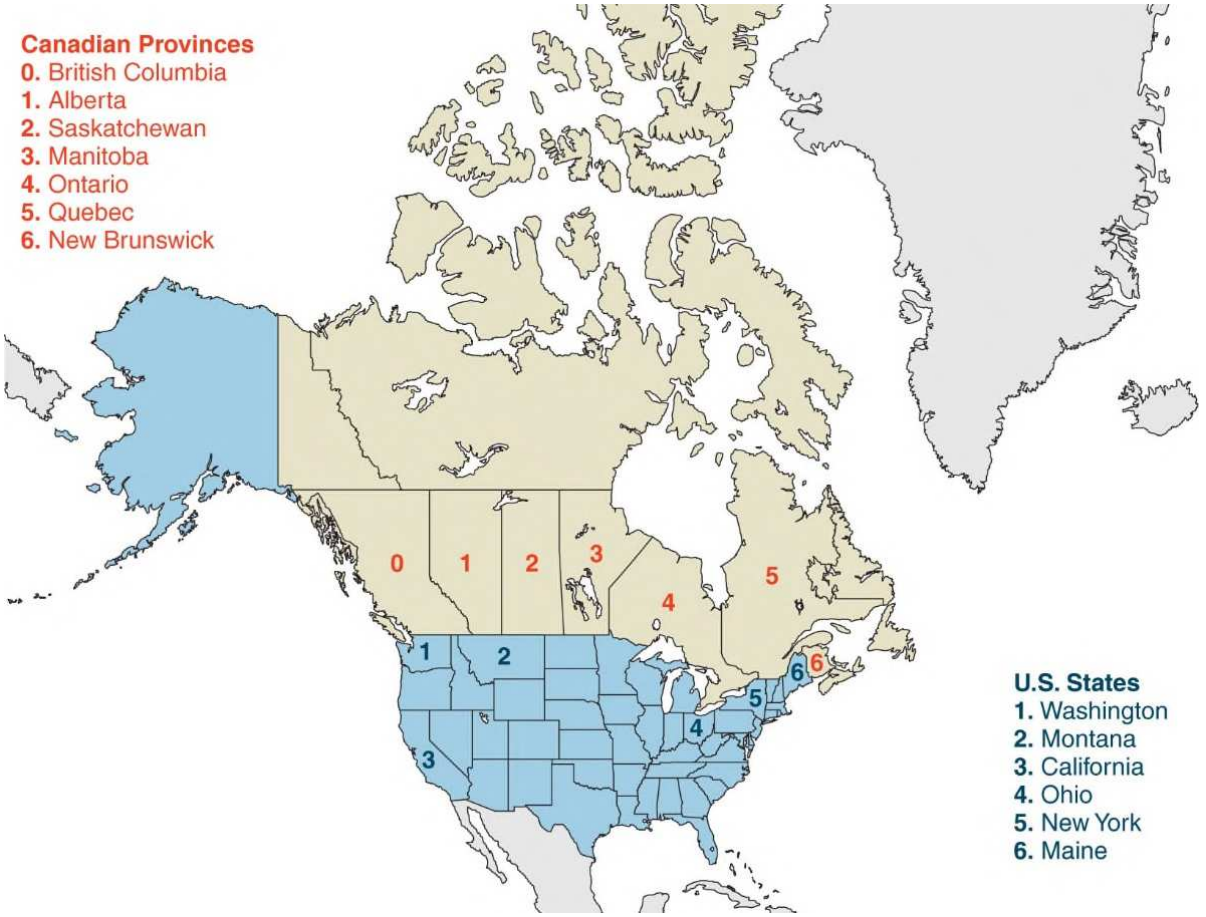
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Impediments to Trade: Distance, Barriers, and Borders (4 of 4)

- Yet even with a free trade agreement between the U.S. and Canada, which use a common language, the border between these countries still seems to be associated with a reduction in trade.
- Data shows that there is much more trade between pairs of Canadian provinces than between Canadian provinces and U.S. states, even when holding distance constant.
- Estimates indicate that the U.S.-Canadian border deters trade as much as if the countries were 1,500-2,500 miles apart.

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Figure 2.4 Canadian Provinces and U.S. States that Trade with British Columbia



Source: Statistics Canada, U.S. Department of Commerce.

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Table 2.1 Trade with British Columbia, as Percent of GDP, 2009

Canadian Province	Trade as Percent of GDP	Trade as Percent of GDP	U.S. State at Similar Distance From British Columbia
Alberta	6.9	2.6	Washington
Saskatchewan	2.4	1.0	Montana
Manitoba	2.0	0.3	California
Ontario	1.9	0.2	Ohio
Quebec	1.4	0.1	New York
New Brunswick	2.3	0.2	Maine

Source: Statistics Canada, U.S. Department of Commerce.

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The Changing Pattern of World Trade: Has the World Gotten Smaller? (1 of 3)

- The negative effect of distance on trade according to the gravity models is significant, but has grown smaller over time due to modern transportation and communication.
- Technologies that have increased trade:
  - Wheels, sails, compasses, railroads, telegraph, steam power, automobiles, telephones, airplanes, computers, fax machines, Internet, fiber optics, personal digital assistants, GPS satellites…

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The Changing Pattern of World Trade: Has the World Gotten Smaller? (2 of 3)

- Political factors, such as wars, can change trade patterns much more than innovations in transportation and communication.
- World trade grew rapidly from 1870 to 1913.
  - Then it suffered a sharp decline due to the two world wars and the Great Depression.
  - It started to recover around 1945 but did not recover fully until around 1970.

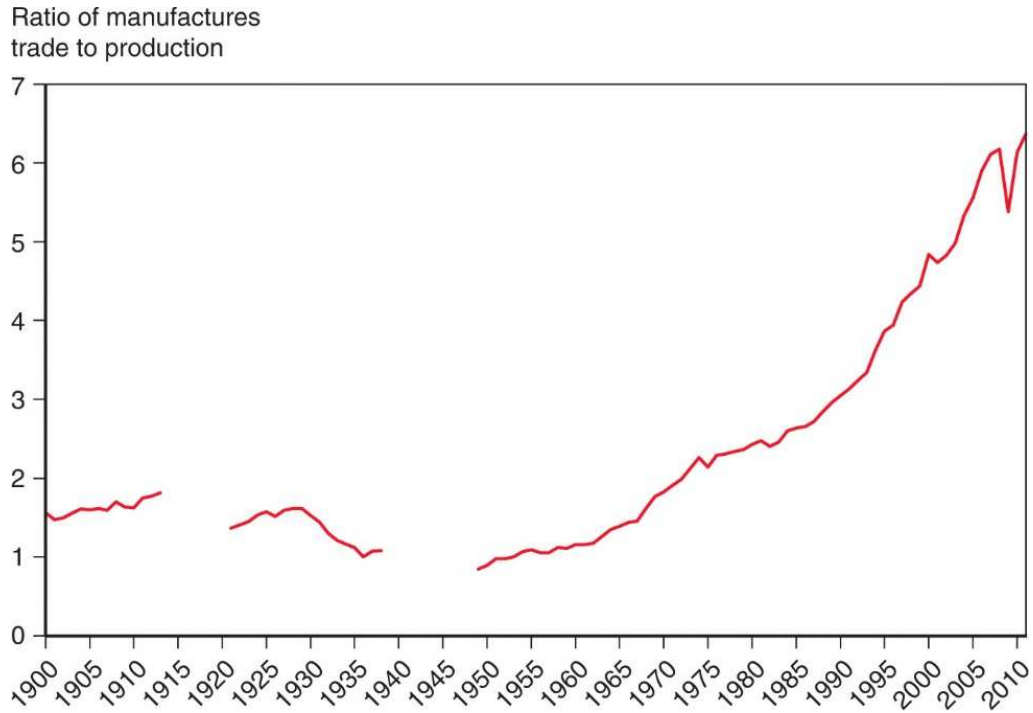
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The Changing Pattern of World Trade: Has the World Gotten Smaller? (3 of 3)

- Since 1970, world trade as a fraction of world GDP has achieved unprecedented heights.
- Vertical disintegration of production has contributed to the rise in the value of world trade through extensive cross-shipping of components.
  - A $100 product can give rise to $200 or $300 worth of international trade flows.

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Figure 2.5 The Fall and Rise of World Trade



The ratio of world exports of manufactured goods to world industrial production rose in the decades before World War I but fell sharply in the face of wars and protectionism. It didn't return to 1913 levels until the 1970s but has since reached new heights.

Source: UN Monthly Bulletin of Statistics, World Trade Organization.

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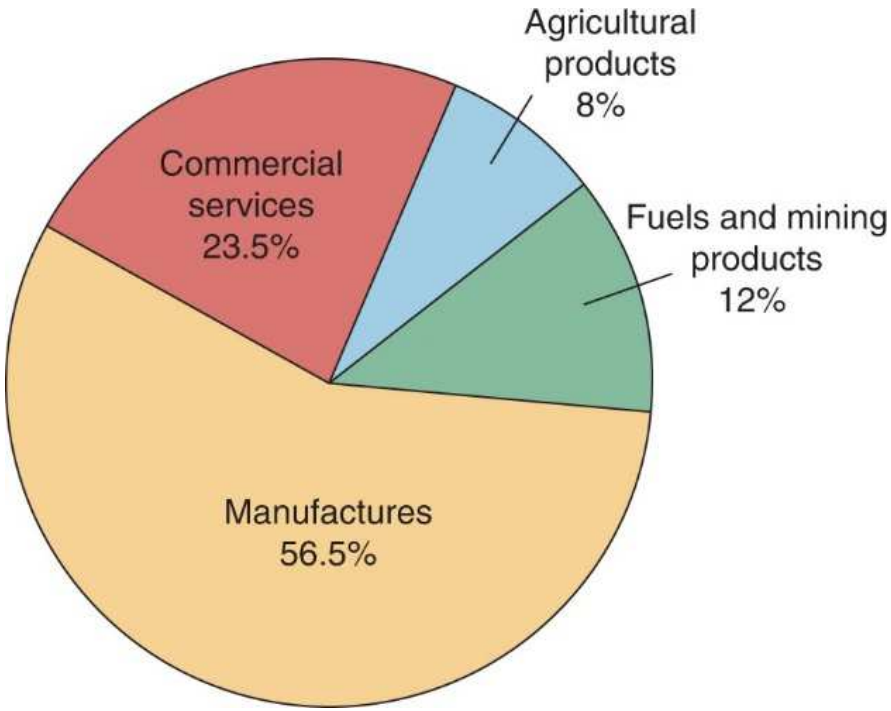
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What Do We Trade? (1 of 3)

- What kinds of products do nations trade now, and how does this composition compare to the past?
- Most (about 57%) of the volume of trade today is in **manufactured products** such as automobiles, computers, and clothing.
  - **Services** such as shipping, insurance, legal fees, and spending by tourists account for about 24% of the volume of trade.
  - **Mineral products** (ex., petroleum, coal, copper) remain an important part of world trade at 12%
  - **Agricultural products** are a relatively small part of trade at 8%.

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Figure 2.6 The Composition of World Trade, 2015



Most world trade is in manufactured goods, but minerals—mainly oil—remain important.

Source: World Trade Organization.

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What Do We Trade? (2 of 3)

- In the past, a large fraction of the volume of trade came from agricultural and mineral products.
  - In 1910, Britain mainly imported agricultural and mineral products, although manufactured products still represented most of the volume of exports.
  - In 1910, the U.S. mainly imported and exported agricultural products and mineral products.
  - In 2002, manufactured products made up most of the volume of imports and exports for both countries.

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Table 2.2 Manufactured Goods as a Percent of Merchandise Trade

	Exports of United Kingdom	Imports of United Kingdom	Exports of United States	Imports of United States
1910	75.4	24.5	47.5	60.7
2015	72.3	73.6	74.8	78.4

Source: 1910 data from Simon Kuznets, **Modern Economic Growth: Rate, Structure and Speed.** New Haven: Yale Univ. Press, 1966. 2015 data from World Trade Organization.

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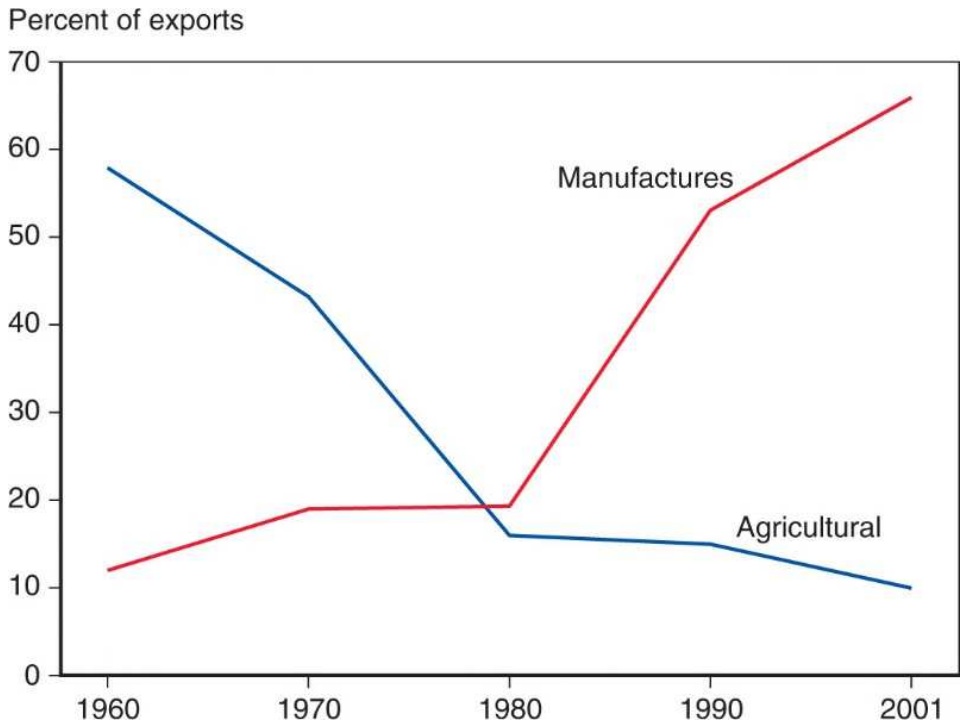
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What Do We Trade? (3 of 3)

- Low- and middle-income countries have also changed the composition of their trade.
  - In 2001, about 65% of exports from low- and middle-income countries were manufactured products, and only 10% of exports were agricultural products.
  - In 1960, about 58% of exports from low- and middle-income countries were agricultural products and only 12% of exports were manufactured products.
- More than 90 percent of the exports of China, the largest developing country and a rapidly growing force in world trade, consist of manufactured goods.

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Figure 2.7 The Changing Composition of Developing-Country Exports



Over the past 50 years, the exports of developing countries have shifted toward manufactures.

Source: United Nations Council on Trade and Development.

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Service Outsourcing (1 of 2)

- **Service outsourcing (or offshoring)** occurs when a firm that provides services moves its operations to a foreign location.
  - Service outsourcing can occur for services that can be transmitted electronically.
    - A firm may move its customer service centers whose telephone calls can be transmitted electronically to a foreign location.
- Other services may not lend themselves to being performed remotely.

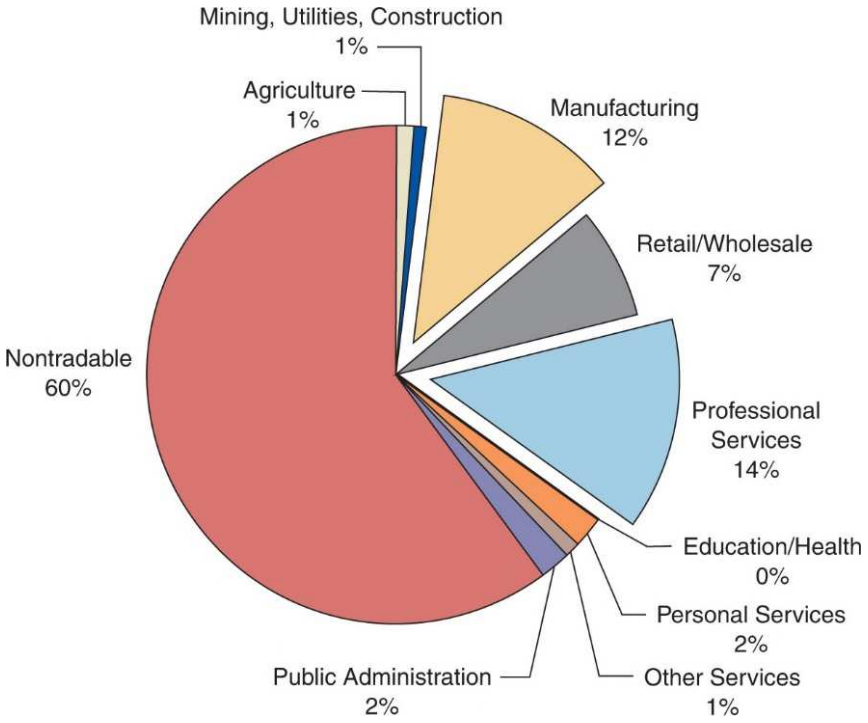
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Service Outsourcing (2 of 2)

- Service outsourcing is currently not a significant part of trade.
  - Some jobs are “tradable” and thus have the **potential** to be outsourced.
  - Most jobs (about 60%) need to be done close to the customer, making them nontradable.

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Figure 2.8 Tradable Industries' Share of Employment



Estimates based on trade within the United States suggest that trade in services may eventually become bigger than trade in manufactures.

Source: J. Bradford Jensen and Lori. G. Kletzer, "Tradable Services: Understanding the Scope and Impact of Services Outsourcing," Peterson Institute of Economics Working Paper 5–09, May 2005.

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Summary (1 of 2)

1. The 5 largest trading partners with the U.S. are China, Canada, Mexico, Japan, and Germany.
2. The largest economies in the EU undertake the largest fraction of the total trade between the EU and the U.S.
3. The gravity model predicts that the volume of trade is directly related to the GDP of each trading partner and is inversely related to the distance between them.

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Summary (2 of 2)

4. Besides size and distance, culture, geography, multinational corporations, and the existence of borders influence trade.
5. Modern transportation and communication have increased trade, but political factors have influenced trade more in history.
6. Today, most trade is in manufactured goods, while historically agricultural and mineral products made up most of trade.

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