

# International Trade Theory



## World Trade: An Overview

In 2007, the world as a whole produced goods and services worth about \$50 trillion at current prices. Of this total, more than 30 percent was sold across national borders: World trade in goods and services exceeded \$16 trillion. There's a whole lot of exporting and importing going on.

In later chapters we'll analyze why countries sell much of what they produce to other countries and why they purchase much of what they consume from other countries. We'll also examine the benefits and costs of international trade and the motivations for and effects of government policies that restrict or encourage trade. Before we get to all that, however, it's helpful to have a sense of who trades with whom, what they sell to each other, and the kinds of goods and services that are traded internationally—especially because the pattern of world trade has changed dramatically over the past few decades.

We begin by describing who trades with whom. An empirical relationship known as the *gravity model* helps to make sense of the value of trade between any pair of countries and also sheds light on the impediments that continue to limit international trade even in today's global economy.

We then turn to the changing structure of world trade. As we'll see, recent decades have been marked by a large increase in the share of world output that is sold internationally, by a shift in the world's economic center of gravity toward Asia, and by major changes in the types of goods that make up that trade.

#### **Learning Goals**

After reading this chapter, you will be able to:

- 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.
- Discuss how distance and borders reduce trade.
- Describe how the share of international production that is traded has fluctuated over time and why there have been two ages of globalization.
- Explain how the mix of goods and services that are traded internationally has changed over time.

## Who Trades with Whom?

Figure 2-1 shows the total value of trade in goods—exports plus imports—between the United States and its top 10 trading partners in 2006. (Data on trade in services are less well broken down by trading partner; we'll talk about the rising importance of trade in services, and the issues raised by that trade, later in this chapter.) Taken together, these 10 countries accounted for 68 percent of the value of U.S. trade in that year.

Why did the United States trade so much with these countries? Let's look at the factors that, in practice, determine who trades with whom.

#### Size Matters: The Gravity Model

Three of the top 10 U.S. trading partners are European nations: Germany, the United Kingdom, and France. Why does the United States trade more heavily with these three European countries than with others? The answer is that these are the three largest European economies. That is, they have the highest values of **gross domestic product** (**GDP**), which measures the total value of all goods and services produced in an economy. There is a strong empirical relationship between the size of a country's economy and the volume of both its imports and its exports.

Figure 2-2 illustrates that relationship by showing the correspondence between the size of different European economies—specifically, the 15 countries that were members of the European Union (EU) in 2003—and their trade with the United States in that year. On the horizontal axis is each country's GDP, expressed as a percentage of the total GDP of the European Union; on the vertical axis is each country's share of the total trade of the United States with the EU. As you can see, the scatter of points clustered around the dotted



#### Total U.S. Trade with Major Partners, 2006

U.S. trade—measured as the sum of imports and exports—is mostly with 10 major partners.

Source: U.S. Department of Commerce.



45-degree line—that is, each country's share of U.S. trade with Europe—was roughly equal to that country's share of European GDP. Germany has a large economy, accounting for 22.9 percent of European GDP; it also accounts for 23.4 percent of U.S. trade with the EU. Sweden has a much smaller economy, accounting for only 2.9 percent of European GDP; correspondingly, it accounts for only 3.3 percent of U.S.–EU trade.

Looking at world trade as a whole, economists have found that an equation of the following form predicts the volume of trade between any two countries fairly accurately,

$$T_{ii} = A \times Y_i \times Y_i / D_{ii} \tag{2-1}$$

where A is a constant term,  $T_{ij}$  is the value of trade between country i and country j,  $Y_i$  is country *i's* GDP,  $Y_j$  is country *j's* GDP, and  $D_{ij}$  is the distance between the two countries. That is, the value of trade between any two countries is proportional, other things equal, to the *product* of the two countries' GDPs, and diminishes with the distance between the two countries.

An equation such as (2-1) is known as a **gravity model** of world trade. The reason for the name is the analogy to Newton's law of gravity: Just as the gravitational attraction between any two objects is proportional to the product of their masses and diminishes with distance, the trade between any two countries is, other things equal, proportional to the product of their GDPs and diminishes with distance.

Economists often estimate a somewhat more general gravity model of the following form:

$$T_{ii} = A \times Y_i^a \times Y_i^b / D_{ii}^c \tag{2-2}$$

This equation says that the three things that determine the volume of trade between two countries are the size of the two countries' GDPs and the distance between the countries, without specifically assuming that trade is proportional to the product of the two GDPs and inversely proportional to distance. Instead, a, b, and c are chosen to fit the actual data as closely as possible. If a, b, and c were all equal to 1, this would be the same as Equation (2-1). In fact, estimates often find that (2-1) is a pretty good approximation.

#### The Logic of the Gravity Model

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Why does the gravity model work? Broadly speaking, large economies tend to spend large amounts on imports because they have large incomes. They also tend to attract large shares of other countries' spending because they produce a wide range of products. So the trade between any two economies is larger, the larger is *either* economy.

Can we be more specific? A highly simplified numerical example helps to explain why trade between any two countries is roughly proportional to the product of their GDPs.

Let's start by observing that a country's GDP, because it is equal to the value of the goods and services it sells, is, by definition, equal to total spending on the goods and services it produces. It follows that a country's share of world GDP is equal to the share of total world spending that is spent on its products. For example, in 2007 the United States accounted for about 25 percent of world GDP; that tells us that in 2007, 25 percent of world spending was devoted to goods and services produced in the United States.

Now let's make a provisional assumption: that everyone in the world spends his or her income in the same proportions. That is, if the United States receives 25 percent of world spending, the reason is that everyone in the world spends 25 percent of his or her income on U.S.-produced goods and services. This assumption obviously isn't true in the real world: In reality, U.S. residents spend a much higher fraction of their income on U.S. products than do the residents of other countries. But bear with us for a moment.

Our next step is to create an imaginary world consisting of four countries, which we'll call A, B, C, and D. Table 2-1 shows each country's share of world spending: We assume that A and B are big economies, which each receive 40 percent of world spending, while C and D are small economies, each receiving 10 percent of world spending. Also, suppose that total world spending is \$10 trillion; then, as also shown in Table 2-1, A and B will each have GDPs of \$4 trillion, while C and D will have GDPs of \$1 trillion each.

But a nation's GDP, the value of the goods and services it sells, is also its income. So if A spends all of its income, it will have total spending of \$4 trillion, as will B. C and D will spend \$1 trillion each.

TABLE 2-1	Hypothetical World Spending Shares and GDP		
Country	Percentage Share of World Spending	GDP (\$ trillion)	
А	40	4	
В	40	4	
С	10	1	
D	10	1	

TABLE 2-2	Values of Exports (\$ trillion)				
То:	Α	В	С	D	
А		1.6	0.4	0.4	
В	1.6	_	0.4	0.4	
С	0.4	0.4	_	0.1	
D	0.4	0.4	0.1		

We can now construct a table, Table 2-2, showing world trade. To understand Table 2-2, bear in mind that country A has an income of \$4 trillion and spends 40 percent of that income on goods and services produced in B. So the value of exports from B to A is \$1.6 trillion. All the other entries in the table are filled in the same way.

Now for the punchline: The trade pattern shown in Table 2-2 exactly fits a gravity model. Exports from country *i* to country *j* are equal to  $0.1 \times \text{GDP}_i \times \text{GDP}_j$ . Clearly, this example is greatly oversimplified, but it does help to explain why trade between two countries is roughly proportional, other things equal, to the product of their GDPs.

What other things aren't equal? As we have already noted, in practice countries spend much or most of their income at home. The United States and the European Union each account for about 25 percent of the world's GDP, but each attracts only about 2 percent of the other's spending. To make sense of actual trade flows, we need to consider the factors limiting international trade. Before we get there, however, let's look at an important reason why the gravity model is useful.

#### **Using the Gravity Model: Looking for Anomalies**

It's clear from Figure 2-2 that a gravity model fits the data on U.S. trade with European countries pretty well but not perfectly. In fact, one of the principal uses of gravity models is that they help us to identify anomalies in trade. Indeed, when trade between two countries is either much more or much less than a gravity model predicts, economists search for the explanation.

Looking again at Figure 2-2, we see that the Netherlands, Belgium, and Ireland trade considerably more with the United States than a gravity model would have predicted. Why might this be the case?

For Ireland, the answer lies partly in cultural affinity: Not only does Ireland share a language with the United States, but tens of millions of Americans are descended from Irish immigrants. Beyond this consideration, Ireland plays a special role as host to many U.S.-based corporations; we'll discuss the role of such *multinational corporations* in Chapter 7.

In the case of both the Netherlands and Belgium, geography and transport costs probably explain their large trade with the United States. Both countries are located near the mouth of the Rhine, Western Europe's longest river, which runs past the Ruhr, Germany's industrial heartland. So the Netherlands and Belgium have traditionally been the point of entry to much of northwestern Europe; Rotterdam in the Netherlands is the most important port in Europe, as measured by the tonnage handled, and Antwerp in Belgium ranks second. The large trade of Belgium and the Netherlands suggests, in other words, an important role of transport costs and geography in determining the volume of trade. The importance of these factors is clear when we turn to a broader example of trade data.

#### Impediments to Trade: Distance, Barriers, and Borders

Figure 2-3 shows the same data as Figure 2-2—U.S. trade as a percentage of total trade with the European Union, versus GDP as a percentage of total EU GDP—but adds two more countries: Canada and Mexico. As you can see, the two neighbors of the United States do a lot more trade with the United States than European economies of equal size. In fact, Canada, whose economy is roughly the same size as Spain's, trades as much with the United States as all of Europe does.

Why do the United States' North American neighbors trade so much more with the United States than its European partners? One main reason is the simple fact that Canada and Mexico are closer.

All estimated gravity models show a strong negative effect of distance on international trade; typical estimates say that a 1 percent increase in the distance between two countries is associated with a fall of 0.7 to 1 percent in the trade between those countries. This drop partly reflects increased costs of transporting goods and services. Economists also believe that less tangible factors play a crucial role: Trade tends to be intense when countries have close personal contact, and this contact tends to diminish when distances are large. It's easy for a U.S. sales representative to pay a quick visit to Toronto; it's a much bigger project for that representative to go to Paris, and unless the company is based on the West Coast, it's an even bigger project to visit Tokyo.

In addition to being U.S. neighbors, Canada and Mexico are part of a **trade agreement** with the United States, the North American Free Trade Agreement, or NAFTA, which ensures that most goods shipped among the three countries are not subject to tariffs or other barriers to



international trade. We'll analyze the effects of barriers to international trade in Chapter 8, and the role of trade agreements such as NAFTA in Chapter 9. For now, let's notice that one use of gravity models is as a way of assessing the impact of trade agreements on actual international trade: If a trade agreement is effective, it should lead to significantly more trade among its partners than one would otherwise predict given their GDPs and distances from one another.

While trade agreements often end all formal barriers to trade between countries, they rarely make national borders irrelevant. Recent economic research has shown that even when most goods and services shipped across a national border pay no tariffs and face few legal restrictions, there is much more trade between regions of the same country than between equivalently situated regions in different countries. The Canadian-U.S. border is a case in point. The two countries are part of a free trade agreement (indeed, there was a Canadian-U.S. free trade agreement even before NAFTA); most Canadians speak English; and the citizens of either country are free to cross the border with a minimum of formalities. Yet data on the trade of individual Canadian provinces both with each other and with U.S. states show that, other things equal, there is much more trade between provinces than between provinces and U.S. states.

Table 2-3 illustrates the extent of the difference. It shows the total trade (exports plus imports) of the Canadian province of British Columbia, just north of the state of Washington, with other Canadian provinces and with U.S. states, measured as a percentage of each province or state's GDP. Figure 2-4 shows the location of these provinces and states. Each Canadian province is paired with a U.S. state that is roughly the same distance from British Columbia: Washington State and Alberta both border British Columbia; Ontario and Ohio are both in the Midwest; and so on. With the exception of trade with the far eastern Canadian province of New Brunswick, intra-Canadian trade drops off steadily with distance. But in each case the trade between British Columbia and a Canadian province is much larger than trade with an equally distant U.S. state.

Economists have used data like those shown in Table 2-3, together with estimates of the effect of distance in gravity models, to calculate that the Canadian-U.S. border, although it is one of the most open borders in the world, has as much effect in deterring trade as if the countries were between 1,500 and 2,500 miles apart.

Why do borders have such a large negative effect on trade? That is a topic of ongoing research. Chapter 20 describes one recent focus of that research: an effort to determine how much effect the existence of separate national currencies has on international trade in goods and services.

IABLE 2-3	Irade	e with British Columbia, as Percent of GDP, 1996			
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	
Saskatchewa	n	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 Brunsw	ick	2.3	0.2	Maine	

**Source:** Howard J. Wall, "Gravity Model Specification and the Effects of the U.S.-Canadian Border," Federal Reserve Bank of St. Louis Working Paper 2000–024A, 2000.



## The Changing Pattern of World Trade

World trade is a moving target. The direction and composition of world trade is quite different today from what it was a generation ago, and even more different from what it was a century ago. Let's look at some of the main trends.

#### Has the World Gotten Smaller?

In popular discussions of the world economy, one often encounters statements that modern transportation and communications have abolished distance, that the world has become a small place. There's clearly some truth to these statements: The Internet makes instant and almost free communication possible between people thousands of miles distant, while jet transport allows quick physical access to all parts of the globe. On the other hand, gravity models continue to show a strong negative relationship between distance and international trade. But have such effects grown weaker over time? Has the progress of transportation and communication made the world smaller?

The answer is yes—but history also shows that political forces can outweigh the effects of technology. The world got smaller between 1840 and 1914, but it got bigger again for much of the 20th century.

Economic historians tell us that a global economy, with strong economic linkages between even distant nations, is not new. In fact, there have been two great waves of globalization, with the first wave relying not on jets and the Internet but on railroads, steamships, and the telegraph. In 1919, the great economist John Maynard Keynes described the results of that surge of globalization:

What an extraordinary episode in the economic progress of man that age was which came to an end in August 1914!... The inhabitant of London could order by telephone, sipping his morning tea in bed, the various products of the whole earth, in such quantity as he might see fit, and reasonably expect their early delivery upon his doorstep.

Notice, however, Keynes's statement that the age "came to an end" in 1914. In fact, two subsequent world wars, the Great Depression of the 1930s, and widespread protectionism did a great deal to depress world trade. Figure 2-5 shows total trade as a percentage of GDP for the United Kingdom and the United States for selected dates over the past two centuries. British trade suffered a major setback in the first half of the 20th century; as a share of GDP, it didn't recover to pre-World War I levels until 1970. Only in the past 20 years or so has international trade become more important to the British economy than it was in 1910. And even today international trade is far less important to the U.S. economy than it was to Britain for most of the 19th century.

#### What Do We Trade?

When countries trade, what do they trade? For the world as a whole, the main answer is that they ship manufactured goods such as automobiles, computers, and clothing to



#### Figure 2-5

#### The Rise, Fall, and Rise of International Trade Since 1830

**Source:** Richard E. Baldwin and Phillipe Martin, "Two Waves of Globalization: Superficial Similarities, Fundamental Differences," in Horst Siebert, ed., *Globalization and Labor* (Tubingen: Mohr, 1999).

each other. However, trade in mineral products—a category that includes everything from copper ore to coal, but whose main component in the modern world is oil—remains an important part of world trade. Agricultural products such as wheat, soybeans, and cotton are another key piece of the picture, and services of various kinds play an important role and are widely expected to become more important in the future.

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Figure 2-6 shows the percentage breakdown of world exports in 2005. Manufactured goods of all kinds made up the lion's share of world trade. Most of the value of mining goods exported in 2005 consisted of oil and other fuels. Trade in agricultural products, although crucial in feeding many countries, accounts for only a small fraction of the value of modern world trade.

Service exports include traditional transportation fees charged by airlines and shipping companies, insurance fees received from foreigners, and spending by foreign tourists. In recent years new types of service trade, made possible by modern telecommunications, have drawn a great deal of media attention. The most famous example is the rise of overseas call and help centers: If you call an 800 number for information or technical help, the person on the other end of the line may well be in a remote country (the Indian city of Bangalore is a particularly popular location). So far, these exotic new forms of trade are still a relatively small part of the overall trade picture, but as explained below that may change in the years ahead.

The current picture, in which manufactured goods dominate world trade, is relatively new. In the past, primary products—agricultural and mining goods—played a much more important role in world trade. Table 2-4 shows the share of manufactured goods in the exports and imports of the United Kingdom and the United States in 1910 and 2002. In the early 20th century Britain, while it overwhelmingly exported manufactured goods, mainly imported primary products. Today manufactures dominate both sides of its trade.



TABLE 2-4	Manufactured Goods as Percent of Merchandise Trade				
	United F	United Kingdom		United States	
	Exports	Imports	Exports	Imports	
1910	75.4	24.5	47.5	40.7	
2002	82.6	80.4	82.1	77.8	

**Source:** 1910 data from Simon Kuznets, *Modern Economic Growth: Rate, Structure and Speed.* New Haven: Yale Univ. Press, 1966. 2002 data from World Trade Organization.

Meanwhile, the United States has gone from a trade pattern in which primary products were more important than manufactures on both sides to one in which manufactured goods dominate on both sides.

A more recent transformation has been the rise of third world manufactures exports. The terms **third world** and **developing countries** are applied to the world's poorer nations, many of which were European colonies before World War II. As recently as the 1970s, these countries mainly exported primary products. Since then, however, they have moved rapidly into exports of manufactured goods. Figure 2-7 shows the shares of agricultural products and manufactured goods in developing-country exports since 1960. There has been an almost complete reversal of relative importance. More than 90 percent of the exports of China, the largest developing economy and a rapidly growing force in world trade, consists of manufactured goods.



#### Figure 2-7

#### The Changing Composition of Developing-Country Exports

Over the past 40 years, the exports of developing countries have shifted toward manufactures.

Source: United Nations Council on Trade and Development.

#### Service Outsourcing

One of the hottest disputes in international economics right now is whether modern information technology, which makes it possible to perform some economic functions at long range, will lead to a dramatic increase in new forms of international trade. We've already mentioned the example of call centers, where the person answering your request for information may be 8,000 miles away. Many other services similarly can be done in a remote location. When a service previously done within a country is shifted to a foreign location, the change is known as **service outsourcing** (sometimes also referred to as service offshoring.)

In a famous *Foreign Affairs* article published in 2006, Alan Blinder, an economist at Princeton University, argued that "in the future, and to a great extent already in the present, the key distinction for international trade will no longer be between things that can be put in a box and things that cannot. It will, instead, be between services that can be delivered electronically over long distances with little or no degradation of quality, and those that cannot." For example, the worker who restocks the shelves at your local grocery has to be on site, but the accountant who keeps the grocery's books could be in another country, keeping in touch over the Internet. The nurse who takes your pulse has to be nearby, but the radiologist who reads your X-ray could receive the images electronically anywhere that has a high-speed connection.

At this point, service outsourcing gets a great deal of attention precisely because it's still fairly rare. The question is how big it might become, and how many workers who currently face no international competition might see that change in the future. One way economists have tried to answer this question is by looking at which services are traded at long distances *within* the United States. For example, many financial services are provided to the nation from New York, the country's financial capital; much of the country's software publishing takes place in Seattle, home of Microsoft; much of the America's (and the world's) Internet search services are provided from the Googleplex in Mountain View, California, and so on.

Figure 2-8 shows the results of one study that systematically used data on the location of industries within the United States to determine which services are and are not tradable at long distances. As the figure shows, the study concluded that about 60 percent of total U.S. employment consists of jobs that must be done close to the customer, making them nontradable. But the 40 percent of employment that is in tradable activities includes more service than manufacturing jobs. This suggests that the current dominance of world trade by manufactures, shown in Figure 2-6, may be only temporary. In the long run, trade in services, delivered electronically, may become the most important component of world trade.

### Do Old Rules Still Apply?

We begin our discussion of the causes of world trade in Chapter 3, with an analysis of a model originally put forth by the British economist David Ricardo in 1819. Given all the changes in world trade since Ricardo's time, can old ideas still be relevant? The answer is a resounding yes. Even though much about international trade has changed, the fundamental principles discovered by economists at the dawn of a global economy still apply.

It's true that world trade has become harder to characterize in simple terms. A century ago, each country's exports were obviously shaped in large part by its climate and natural resources. Tropical countries exported tropical products such as coffee and cotton; land-rich countries such as the United States and Australia exported food to densely populated European nations. Disputes over trade were also easy to explain: The classic political battles over free trade versus protectionism were waged between English landowners who wanted protection from cheap food imports and English manufacturers who exported much of their output.



The sources of modern trade are more subtle. Human resources and human-created resources (in the form of machinery and other types of capital) are more important than natural resources. Political battles over trade typically involve workers whose skills are made less valuable by imports—clothing workers who face competition from imported apparel, and tech workers who now face competition from Bangalore.

As we'll see in later chapters, however, the underlying logic of international trade remains the same. Economic models developed long before the invention of jet planes or the Internet remain key to understanding the essentials of 21st century international trade.

#### **SUMMARY**

- 1. The *gravity model* relates the trade between any two countries to the sizes of their economies. Using the gravity model also reveals the strong effects of distance and international borders—even friendly borders like that between the United States and Canada—in discouraging trade.
- **2.** International trade is at record levels relative to the size of the world economy, thanks to falling costs of transportation and communications. However, trade has not grown

in a straight line: The world was highly integrated in 1914, but trade was greatly reduced by depression, protectionism, and war, and took decades to recover.

- **3.** Manufactured goods dominate modern trade today. In the past, however, primary products were much more important than they are now; recently, trade in services has become increasingly important.
- **4.** *Developing countries*, in particular, have shifted from being mainly exporters of primary products to mainly exporters of manufactured goods.

#### **KEY TERMS**

developing countries, p. 22 gravity model, p. 14 gross domestic product (GDP), p. 13 service outsourcing, p. 23 third world, p. 22 trade agreement, p. 17

#### PROBLEMS



- 1. Canada and Australia are (mainly) English-speaking countries with populations that are not too different in size (Canada's is 60 percent larger). But Canadian trade is twice as large, relative to GDP, as Australia's. Why should this be the case?
- 2. Mexico and Brazil have very different trading patterns. Mexico trades mainly with the United States, Brazil trades about equally with the United States and with the European Union; Mexico does much more trade relative to its GDP. Explain these differences using the gravity model.
- **3.** Equation (2.1) says that trade between any two countries is proportional to the product of their GDPs. Does this mean that if the GDP of every country in the world doubled, world trade would quadruple? Analyze this question using the simple example shown in Table 2-2.
- 4. Over the past few decades, East Asian economies have increased their share of world GDP. Similarly, intra-East Asian trade—that is, trade among East Asian nations—has grown as a share of world trade. More than that, East Asian countries do an increasing share of their trade with each other. Explain why, using the gravity model.
- **5.** A century ago, most British imports came from relatively distant locations: North America, Latin America, and Asia. Today, most British imports come from other European countries. How does this fit in with the changing types of goods that make up world trade?

#### FURTHER READINGS

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- World Bank. World Development Report 1995. Each year the World Bank spotlights an important global issue; the 1995 report focused on the effects of growing world trade.
- World Trade Organization. World Trade Report. An annual report on the state of world trade. Each year's report has a theme; for example, the 2004 report focused on the effects on world trade of domestic policies such as spending on infrastructure.

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