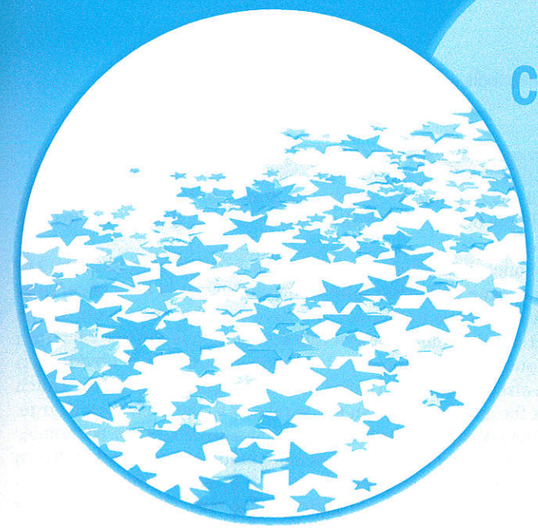


Chapter

*Everything should be made as simple as possible, but not simpler.*

**Albert Einstein**

# Essential microeconomic tools

## Chapter Contents

## Introduction

This chapter presents the tools that we shall need when we begin our study of European economic integration in the next chapter. The tools are simple because we make a series of assumptions that greatly reduce the complexity of economic interactions.

The primary simplification in this chapter concerns the behaviour of firms. In particular, all firms are assumed to be 'perfectly competitive', i.e. we assume that firms take as given the prices they observe in the market. Firms, in other words, believe that they have no impact on prices and that they could sell as much as they want at the market price. A good way of thinking about this assumption is to view each firm as so small that it believes that its choice of output has no impact on market prices. This is obviously a very rough approximation since even medium-sized firms – the Danish producer of Lego toys or the Dutch brewer of Heineken, for example – realize that the amount they can sell is related to the price they charge.

The second key simplification concerns technology, in particular scale economies. Scale economies refer to the way that per unit cost (average cost) falls as a firm produces more units. Almost every industry is subject to some sort of falling average cost, so considering them (in Chapter 6) will be important, but a great deal of simplification can be gained by ignoring them. This simplification, in turn, allows us to master the essentials before adding in more complexity in subsequent chapters.

## 4.1 Preliminaries I: supply and demand diagrams

Assessing many economic aspects of European integration is made clearer with the help of a simple yet flexible diagram with which to determine the price and volume of imports, as well as the level of domestic consumption and production. The diagram we use – the 'import supply and import demand diagram' – is based on straightforward supply and demand analysis. But to begin from the beginning, we quickly review where demand and supply curves come from. Note that this section assumes that readers have had some exposure to supply and demand analysis; our treatment is intended as a review rather than an introduction. Readers who find it too brief should consult an introductory economics textbook such as Mankiw (2011).

Well-prepared readers may want to skip this section, moving straight on to Section 4.2.

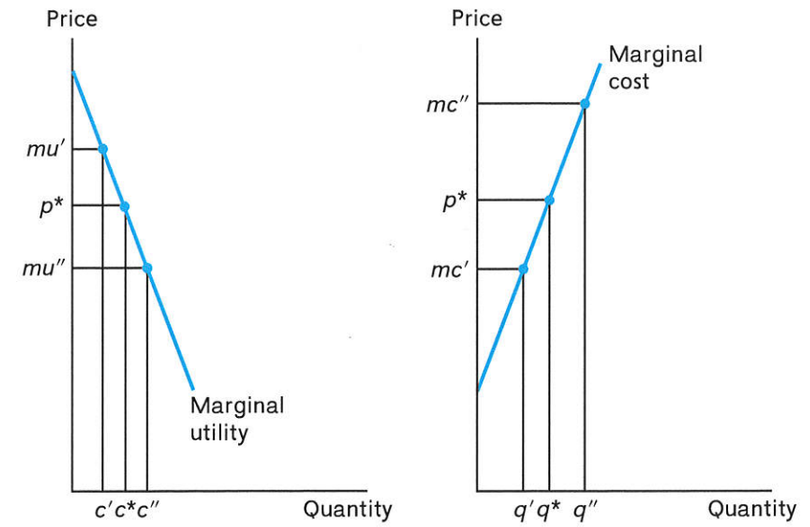
### 4.1.1 Demand curves and marginal utility

A demand curve shows how much consumers would buy of a particular good at any particular price. Generally speaking, consumers strive to spend their money in a way that maximizes their material well-being. Their demand curve is thus based on some sort of optimization exercise. To see this, the left-hand panel of Figure 4.1 plots the 'marginal utility' curve for a typical consumer, i.e. the 'happiness' (measured in euros) that consumers would get from consuming an extra unit of the good given that they are already consuming a certain number of units. For example, if we are considering the demand for cups of coffee, the marginal utility curve shows how much extra joy a consumer gets from having one more cup starting from any given number of cups already consumed. Typically the extra joy from an extra cup falls with the number of cups bought per day. For example, if the consumer buys very few cups of coffee per day, say $c'$ in the diagram, the gain from buying an extra one is likely to be pretty high, for example $mu'$ in the diagram. If, however, the consumer buys lots of cups already, then the gain from one more is likely to be much lower. This is shown by the pair, $c''$ and $mu''$.

This marginal utility curve allows us to work out how much the consumer would buy at any given price. Suppose the consumer could buy as many cups as she likes at the price $p^*$. How many would she buy? If the consumer is wise, and we assume she is, she will buy cups of coffee up to the point where the last one bought is just barely worth the price. In the diagram, this level of purchase is given by $c^*$ since the marginal benefit (utility) from buying an extra cup exceeds the cost of doing so (the price) for all levels of purchase up to $c^*$. At this point, the consumer finds that additional cups would not be worth the price. For example, the marginal utility from buying $c^*$ plus one cups of coffee would be below $p^*$. As usual, one gets the market demand for cups of coffee by adding all consumers' individual marginal utility curves horizontally (e.g. if the price is $p^*$ and there are 100 identical consumers, market demand will be 100 times $c^*$).



**Figure 4.1** Optimization and demand and supply curves




A key point to retain from this is that the price that consumers face reflects the marginal utility of consuming a little more.

### 4.1.2 Supply curves and marginal costs

Derivation of the supply curve follows a similar logic, but here the optimization is done by firms. The right-hand panel of Figure 4.1 shows the 'marginal cost' curve facing a typical firm (assume they are all identical for the sake of simplicity), i.e. the extra cost involved in making one more unit of the good. While the marginal cost of production in the real world often declines with the scale of production, allowing for this involves consideration of scale economies and these, in turn, introduce a whole range of complicating factors that would merely clutter the analysis at this stage. To keep it simple, we assume that firms are operating at a point where the marginal cost is upward sloping, i.e. that the cost of producing an extra unit rises as the total number of units produced rises. The curve in the diagram shows, for example, that it costs $mc'$ to produce one more unit when the production level (e.g. the number of cups of coffee per day) is $q'$. This is less than the cost, $mc''$, of producing an extra unit when the firm is producing $q''$ units per year.

Using this curve we can determine the firm's supply behaviour. Presuming that the firm wants to maximize profit, the firm will supply goods up to the point where the marginal cost just equals the price. For example, if the price is $p^*$, the firm will want to supply $q^*$ units. Why? If the firm offered one less than $q^*$ units, it would be missing out on some profit. After all, at that level of output, the price the firm would receive for the good, $p^*$, exceeds the marginal cost of producing it. Likewise, the firm would not want to supply any more than $q^*$ since, for such a level of output, the marginal cost of producing an extra unit is more than the price. Again, we get the aggregate supply curve by adding all the firms' individual marginal cost curves horizontally.

A key point here is that, under perfect competition, the price facing producers reflects the marginal production cost, i.e. the cost of producing one more unit than the firm produces in equilibrium.

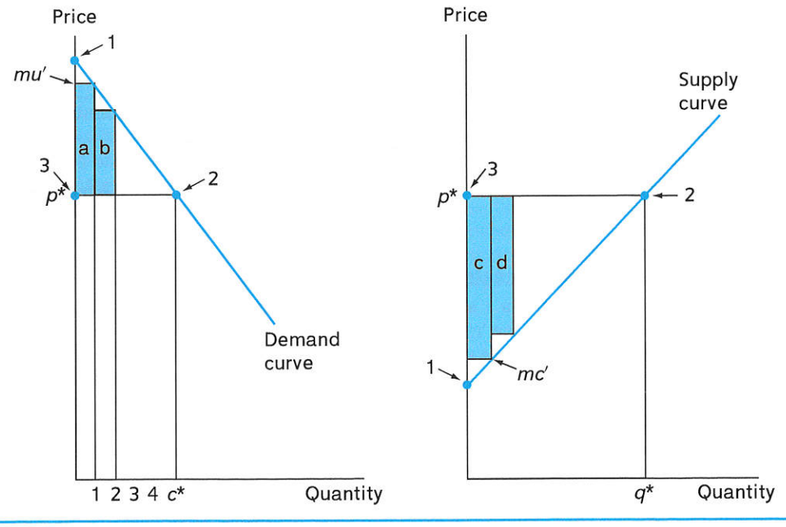
### 4.1.3 Welfare analysis: consumer and producer surplus

Since the demand curve is based on consumers' evaluation of the happiness they get from consuming a good and the supply curve is based on firms' evaluation of the cost of producing it, the curves can be used

to show how consumers and firms are affected by changes in the price. The tools we use, 'consumer surplus' and 'producer surplus', are described below.

Consumers buy up to the point where their marginal utility just equals the price. For all other units bought, the marginal utility exceeds the price. This means that the consumer gets what is known as 'consumer surplus' from buying $c^*$ units at price $p^*$ (see Figure 4.2). In words, this says that consumers get more (in terms of utility) than they pay for. How much? For the first unit bought, the marginal unit was $mu'$ but the price paid was only $p^*$, so the surplus is the area shown by the rectangle 'a'. For the second unit, the marginal utility was somewhat lower (not shown in the diagram), so the surplus is lower; specifically, it is given by the area 'b'. Doing the same for all units shows that buying $c^*$ units at $p^*$ yields a total consumer surplus equal to the sum of all the resulting rectangles. If we take the units to be very finely defined, the triangle defined by the points 1, 2 and 3 gives us the total consumer surplus. Box 4.1 discusses a real-world illustration of consumer surplus.

**Figure 4.2** Deriving consumer and producer surplus




## Box 4.1 Consumer surplus and Swiss Rail's Half Fare Card

Switzerland's wonderful rail system can be expensive, so many tourists buy the Half Fare Card; in 2011, it cost 85 GBP for a one-month pass. The fact that people pay to get unlimited access to a lower price is an example of consumer surplus in action. To see this, ask yourself what would be the maximum you would pay for being able to buy half-price tickets. For example, suppose you were planning a two-week trip that involved 20 individual train trips. Suppose the average price was 10 GBP, so you would spend 200 GBP without the card. With the card you spend only 100 GBP, so you would be willing to pay up to 100 pounds for a Half Fare card. In fact, you would probably be willing to pay a bit more than 100 GBP since at the lower per-trip price (i.e. 5 GBP versus 10), you would probably take a few trips more than you found optimal at the full price.



An analogous line of reasoning shows us that the triangle formed by points 1, 2 and 3 in the right-hand panel gives us a measure of the gain firms get from being able to sell $q^*$ units at a price of $p^*$. Consider the first unit sold. The marginal cost of producing this unit was $mc'$ but this was sold for $p^*$ so the firm earns a surplus, what we call the 'producer surplus', equal to the rectangle 'c' in the right-hand panel. Doing the same exercise for each unit sold shows that the total producer surplus is equal to the triangle defined by points 1, 2 and 3.

By drawing similar diagrams on your own, you should be able to convince yourself that a price rise increases producer surplus and decreases consumer surplus. A price drop does the opposite.

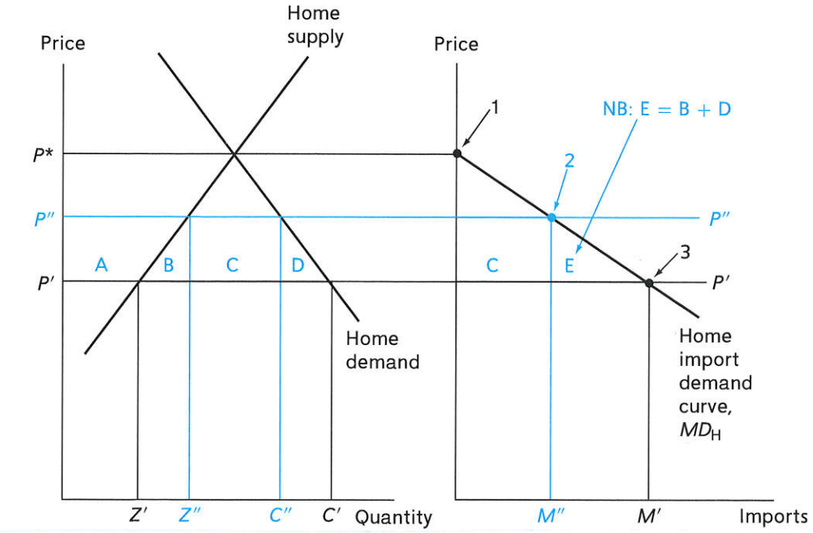
## 4.2 Preliminaries II: introduction to open-economy supply and demand analysis

This section introduces the 'workhorse' diagram – the open-economy supply and demand diagram – that is essential to our study of European economic integration. Well-prepared readers may consider skipping, moving straight on to the tariff analysis in Section 4.3. The diagram, however, is used throughout this chapter and the next, so even advanced students may wish to briefly review the diagram's foundations; if nothing else, such a review will help with the terminology.

### 4.2.1 The import demand curve

We first look at where the import demand curve comes from; Figure 4.3 facilitates the analysis.

**Figure 4.3** Deriving the import demand curve and welfare changes




*Note:* Readers who find these diagrams complicated may benefit from the step-by-step explanations given in the interactive PowerPoint presentation available on the companion website: http://www.mheducation.co.uk/textbooks/baldwin5/.

The left-hand panel of the diagram depicts a nation's supply and demand curves for a particular good. As usual, the domestic price is on the vertical axis; quantity is on the horizontal axis. If imports of the good were banned for some reason, the nation would only be able to consume as much as it produced. The result

would be a market price of $P^*$ since this is the price where the amount that consumers want to buy just matches the amount that firms want to produce. Plainly, import demand is zero at $P^*$ (for simplicity, we assume that imported and domestic goods are perfect substitutes). This zero-import point is marked in the right-hand panel as point 1; this diagram has the same price on the vertical axis, but plots imports on the horizontal axis.

How much would the nation import if the price were lower, say, $P'$? The first thing to note is that the import price will fix the domestic price. Imports are always available at $P'$, so no consumer would pay more than $P'$. Of course, domestic producers must match the import competition, so $P'$ becomes the domestic price.

The second thing to note is the impact of $P'$ on consumption, production and imports. Consumption demand would be $C'$ and domestic production would be $Z'$. As $C'$ exceeds $Z'$, consumers buy more than domestic firms are willing to produce at $P'$. The 'excess' demand is met by imports. That is to say, imports are the difference between $C'$ and $Z'$ (in symbols, $M' = C' - Z'$).

What this tells us is that import demand at $P'$ is $M'$. This point is marked in the right-hand panel of the diagram as point 3. Performing the same exercise for $P''$ yields point 2, and doing the same for every possible import price yields the import demand curve, i.e. the amount of imports that the nation wants at any given domestic price. The resulting curve is shown as $MD_H$ in the right-hand panel. (For convenience, we often call the nation under study 'Home' to distinguish it from its trade partner which we call 'Foreign'.)

### *Welfare analysis: MD curves as the marginal benefit of imports*

When studying European economic integration, a critical question that arises time and again is the extent to which a policy raises or lowers nations' welfare. In answering such questions, it is useful to know how to carry out welfare analysis with the import demand curve.

Consider a rise in the import price from $P'$ to $P''$. As argued above, the higher import price means the domestic price rises by the same amount. The corresponding equilibrium level of imports drops to $M''$, since consumption drops to $C''$ and production rises to $Z''$. We can see the welfare analysis in the left-hand panel using the standard notions of consumer and producer surpluses (see Section 4.1). Specifically, the price rise lowers consumer surplus by A + B + C + D. The same price rise increases producer surplus by A. The right-hand panel shows how this appears in the import demand diagram. From the left-hand panel, the import price rise means a net loss to the country of B + C + D, since the area A cancels out (area A is a gain to Home producers and a loss to Home consumers). In the right-hand panel, these changes are shown as areas C and E; as it turns out, area E equals area B + D.

### *A powerful perspective: trade volume effects and border price effects*

It proves insightful to realize that the $MD_H$ curve shows the marginal benefit of imports to Home. Before explaining why this is true, we show that it is a useful insight. As we saw above, Home loses areas C and E when the price of imports rises from $P'$ to $P''$. Area C is easy to understand. After the price rise, Home pays more for the units it imported at the old price. Area C is the size of this loss. (Say the price rise was €1.2 per unit and $M''$ was 100; the loss would be €1.2 times 100; geometrically, this is the area C since a rectangle's area is its height times its base.) Understanding area E is where the insight comes in handy. Home reduces its imports at the new price and area E measures how much it loses from the drop in imports. The marginal value of the first lost unit is the height of the $MD_H$ curve at $M''$. But since Home had to pay $P'$ for this unit, the net loss is the gap between $P'$ and the $MD_H$ curve. If we add up the gaps for all the extra units imported, we get the area E. The jargon terms for these areas are the 'border price effect' (area C) and the 'import volume effect' (area E).

To understand why $MD_H$ is the marginal benefit of imports, we use three facts and one bit of logic: (1) the $MD_H$ curve is the difference between the domestic demand curve and the domestic supply curve; (2) the domestic supply curve is the domestic marginal cost curve, and the domestic demand curve is the domestic marginal utility curve (see Section 4.1 if these points are unfamiliar); and (3) the difference between domestic marginal utility of consumption and domestic marginal cost of production is the net gain to the nation of producing and consuming one more unit. The logical point is that an extra unit of imports leads to some combination of higher consumption and lower domestic production, and this leads to some combination of higher utility and lower costs; the height of the $MD_H$ curve tells us what that combination is.



Or, to put it differently, the nation imports up to the point where the marginal gain from doing so equals the marginal cost. Since the border price is the marginal cost, the border price is also an indication of the marginal benefit of imports.

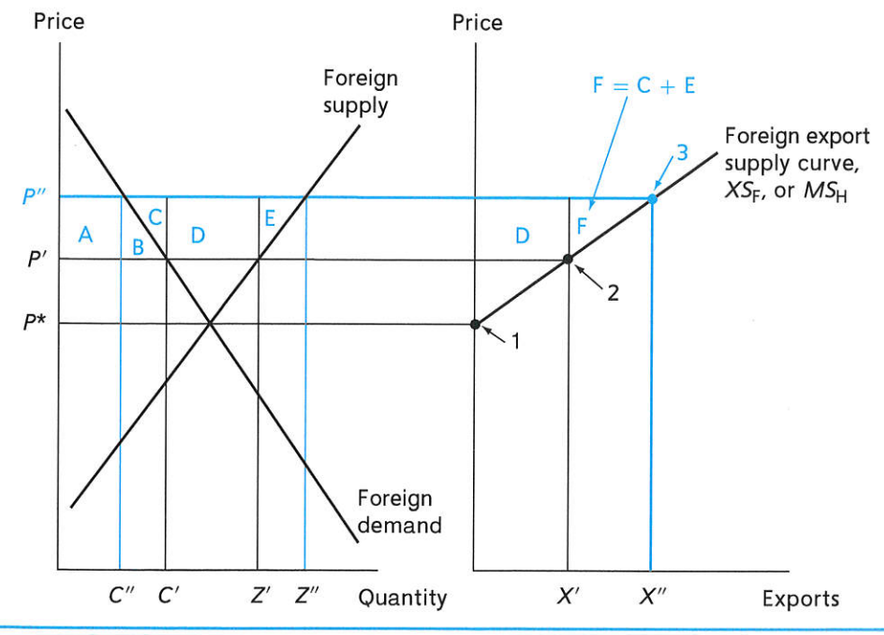
To see these points in more detail, see the interactive PowerPoint presentations available on this book's Online Learning Centre, http://www.mheducation.co.uk/textbooks/baldwin5/.

## 4.2.2 The export supply curve

Figure 4.4 uses an analogous line of reasoning to derive the import supply schedule. The first thing to keep in mind is that the supply of imports to Home is the supply of exports from foreigners. For simplicity's sake, suppose that there is only one foreign country (simply called 'Foreign' hereafter) and its supply and demand curves look like the left-hand panel of the figure. (Note that the areas in Figure 4.4 are unrelated to the areas in Figure 4.3.)

As with the import demand curve, we start by asking how much Foreign would export for a particular price. For example, how much would it export if the price of its exports was $P''$? At price $P'$, Foreign firms would produce $Z'$ and Foreign consumers would buy $C'$. The excess production (equal to $X' = Z' - C'$) would be exported. (Note that, as in the case of import demand, the export price sets the price in Foreign; Foreign firms have no reason to sell for less since they can always export, and competition among Foreign suppliers would prevent any of them from charging Foreign consumers a higher price.) The fact that Foreign would like to export $X'$ when the export price is $P'$ is shown in the right-hand panel at point 2.

**Figure 4.4** Deriving the export supply curve and welfare changes




As the price for Foreign exports (i.e. Home's import price) rose, Foreign would be willing to supply a higher level of exports for two reasons. The higher price would induce Foreign firms to produce more and Foreign consumers to buy less. For example, the price $P''$ would bring forth an import supply equal to $X''$ (this equals $Z'' - C''$); this is shown as point 3 in the right-hand panel. At price $P^*$, exports are zero. Plotting all such combinations in the right-hand panel produces the export supply curve $XS_F$. We stress again the simple but critical point that the Foreign export supply is the Home import supply, thus we also label $XS_F$ as $MS_H$.

### *Welfare*

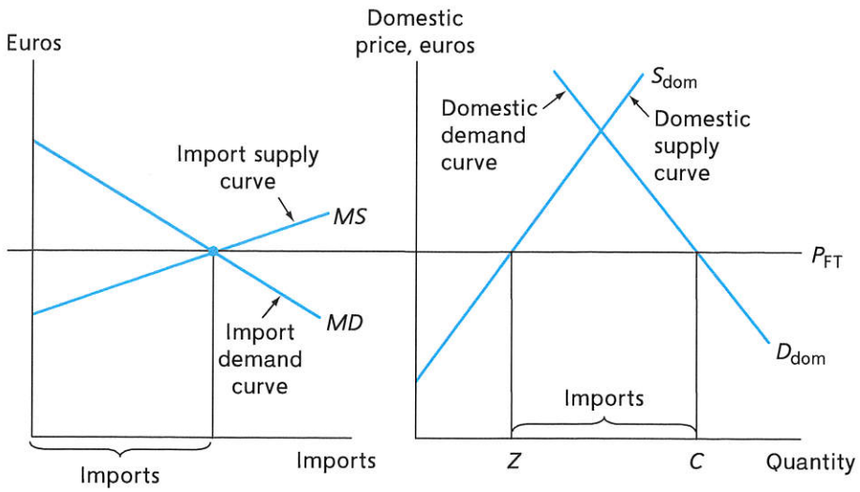
The left-hand panel also shows how price changes translate into Foreign welfare changes. If the export price rises from $P'$ to $P''$, consumers in Foreign lose by A + B (these letters are not related to those in the previous figure), but the Foreign firms gain producer surplus equal to A + B + C + D + E. The net gain is therefore C + D + E. Using the export supply curve $XS_F$, we can show the same net welfare change in the right-hand panel as the area D + F. Note that the insight from the $MD_H$ curve extends to the $XS_F$ curve, i.e. the $XS_F$ curve gives the marginal benefit to Foreign of exporting.

This review of import supply and demand was very rapid – probably too rapid for students who have never used such diagrams and probably too slow for students who have. For those who find themselves in the first category, interactive PowerPoint presentations that go over the diagram in greater detail are available at www.mheducation.co.uk/textbooks/baldwin5.

## 4.2.3 The workhorse diagram: *MD–MS*

The big payoff from having an import supply curve and an import demand curve is that it permits us to find the equilibrium price and quantity of imports. The equilibrium price is found by putting together import demand and supply as shown in the left-hand panel of Figure 4.5; we drop the 'H' and 'F' subscripts for convenience.

**Figure 4.5** The *MD–MS* and open-economy supply and demand diagrams




Assuming imports and domestic production are perfect substitutes, the domestic price is set at the point where the demand and supply of imports meet, namely, $P_{FT}$ (FT stands for free trade). While the import supply and demand diagram, or *MD–MS* diagram for short, is handy for determining the price and volume of imports, it does not permit us to see the impact of price changes on domestic consumers and firms separately. This is where the right-hand panel becomes useful. In particular, we know that the market clears only when the price is $P_{FT}$, so we know that Home production equals $Z$ and Home consumption equals $C$. The equilibrium level of imports may be read off either panel. In the left-hand panel, it is shown directly; in the right-hand one, it is the difference between domestic consumption and production.

Having explained these basic microeconomic tools, we turn now to using them to study a simple but common real-world problem – the effects of a tax on imports from all nations. Such taxes are called tariffs.



## 4.3 MFN tariff analysis

To build from simple to complex, we preface the analysis of preferential trade liberalization in Europe with a simpler example, but one that nevertheless is useful for understanding the world. That is, we introduce the basic method of analysis and gain experience in using the diagrams by first studying the impact of removing the simplest type of trade barrier – a tariff that is applied to imports from all trade partners. We call this a non-discriminatory liberalization.

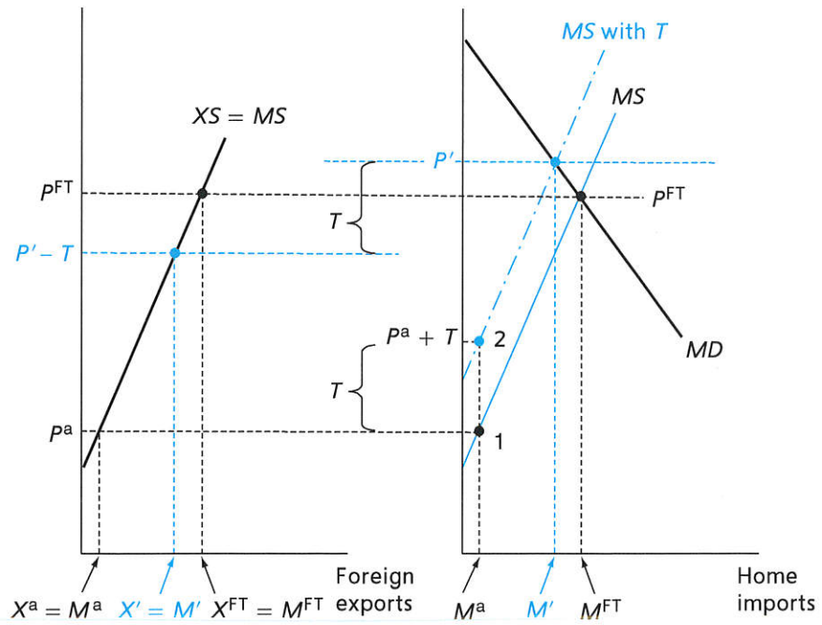
Although this is not what happened when Europe integrated economically, we first look at the non-discriminatory case since it is less complex. An extra benefit of taking this detour is that it helps us understand the effects of the EU lowering its common external tariff – as it does in the context of world trade talks (see Chapter 12). For historical reasons, a non-discriminatory tariff is called a 'most favoured nation' tariff, which provides the handy abbreviation, MFN.

## 4.3.1 Price and quantity effects of a tariff

The first step is to determine how a tariff changes prices and quantities. To be concrete, suppose that the tariff imposed equals $T$ euros per unit.

The first step in finding the post-tariff price is to work out how the tariff changes the *MD–MS* diagram; here, Figure 4.6 facilitates the analysis. (See Section 4.2 if you are unfamiliar with the *MD–MS* diagram.)

**Figure 4.6** Price and quantity effects of an MFN tariff




*Note:* Observe the distinction between the domestic and border prices. The domestic price is the price that domestic consumers pay for the good. The border price is the price foreign producers receive when they sell the good to Home. They can differ because of the tariff (a tariff is nothing more than a tax on imports). When you buy a coffee at a café for, say, 1 euro, the café owner does not get the full euro because the owner has to pay a tax, called the VAT, on your purchase. As a result, the price that the café owner receives is only 80 cents (the VAT is 20 per cent in this example) even though you pay 100 cents. In exactly the same way, foreigners receive a price (the border price) that equals the domestic price minus the tariff.

The right-hand panel of Figure 4.6 shows the pre-tariff import demand and import supply curves as *MD* and *MS*, respectively. The left-hand panel shows the foreign export supply curve as *XS*. Note that the vertical axis in this right-hand panel shows the domestic price, while the vertical axis in the left-hand panel shows the border price – the difference between the two is simple, but critical (see the note to Figure 4.6).

### *A tariff shifts up the MS curve*

Imposition of a tariff has no effect on the *MD* curve in the right-hand panel since the *MD* curve tells us how much Home would like to import at any given *domestic* price. By contrast, imposing a tariff on imports shifts up the *MS* curve by *T*. The reason is simple. After the tariff is imposed, the domestic price must be higher by *T* to get Foreign to offer the same quantity as it offered before the tariff. Consider an example. How much would Foreign supply before the tariff if the Home domestic price before the tariff were $P^a$? The answer, which is given by point 1 on the *MS* curve, is $M^a$. After the tariff, we get a different answer. To get Foreign to offer $M^a$ after the tariff, the domestic price must be $P^a + T$ so that Foreign sees a border price of $P^a$.

Having shown that the tariff shifts up the *MS* curve, consider next the tariff's impact on equilibrium prices and quantities.

### *The new equilibrium prices and quantities*

Even without a diagram, readers will surely realize that a tariff raises the domestic price and lowers imports. After all, a tariff is a tax on imports and it is intuitively obvious that putting a tax on imports will raise prices somewhat and lower imports somewhat. Why do we need a diagram?

The diagram helps us be more specific about this intuition; this specificity allows us to work out how much the nations gain or lose from the tariff. Returning to our analysis, note that, after the tariff, the old import supply curve is no longer valid. The new import supply curve, labelled *MS with T*, is what matters and the equilibrium price is set at the point where the new import supply curve and the import demand curve cross. As intuition would have it, the new price – marked *P′* in the diagram – is higher than the pre-tariff price $P^{FT}$ (as already noted, FT stands for free trade). Because of the higher domestic price, Home imports are reduced to *M′* from $M^{FT}$. To summarize, there are five price and quantity effects of the tariff:

1. The price facing Home firms and consumers (domestic price) rises to *P′*.
2. The border price (i.e. the price Home pays for imports) falls to *P′ – T*; this also means that the price received by Foreigners falls to *P′ – T*.
3. The Home import volume falls to *M′*.

The other two effects cannot be seen in Figure 4.6, but are obvious to readers who worked through Figure 4.3. The higher domestic price stimulates production and discourages consumption. Specifically:

4. Home production rises.
5. Home consumption falls.

There are also production and consumption effects of the tariff inside the exporting nation. Since the border price falls, Foreign production drops and Foreign consumption rises. We could see this explicitly if we put a diagram like the left-hand panel of Figure 4.4 to the left of the diagram in Figure 4.6. You may want to do this as an exercise to test your familiarity with the diagrams.

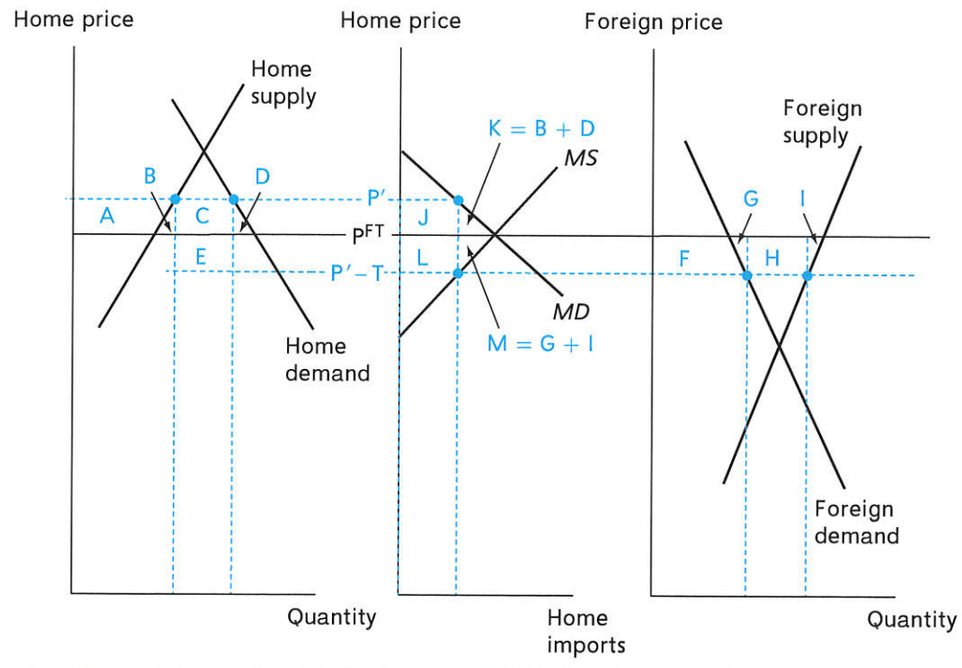
## 4.3.2 Welfare effects of a tariff

Having worked out the price and quantity effects, it is simple to calculate the welfare effects of the tariffs; that is to say, who wins, who loses and by how much. The analysis is really just a combination of what we did in Figures 4.3 and 4.4; this is done in Figure 4.7. The left-hand panel shows Home's supply and demand, the middle panel shows the world market for imports and the right-hand panel shows the Foreign supply and demand. We start with Home.

As shown in Figure 4.7, the MFN tariff raises the Home price of the good (to *P′*) while lowering the border price (to P′ − T). Home consumers lose A + B + C + D, Home producers gain A and Home government



**Figure 4.7** Welfare effects of an MFN tariff




gains tariff revenue C + E. The net Home welfare effect is +E − B − D. This can be positive or negative depending upon the size of the tariff (you can show that it will be negative for very large tariffs, but positive for sufficiently small tariffs).

Turning to Foreign, we see that Home's tariff has lowered the border price facing Foreign exporters and this in turn brings down the price faced by Foreign producers and consumers. Foreign consumers gain F while Foreign firms lose F + G + H + I. There is no change in tariff revenue (the tariff is paid to the Home government), so the net impact on Foreign is –G − H − I. This is plainly negative regardless of the tariff's size.

### *A useful condensation*

The first time one works through these welfare calculations, it is useful to consider the full distributional effects as we did in Figure 4.7. (i.e. the impact on consumers, producers and government revenue). Yet, once one is familiar with the diagrams, it is convenient to condense the analysis into a single diagram, like the centre panel in Figure 4.7. This lets us show the overall welfare effects of a Home tariff on both nations. Using the area labels in the centre panel, Home's welfare changes by +L − K, Foreign's welfare changes by −L − M, so world welfare falls by −K − M.

To summarize, we find:

- The tariff reduces Foreign welfare since it means it sells less and receives a lower price.
- The tariff creates private-sector winners and losers (Home firms gain, Home consumers lose), but the losers (consumers) lose more than the gainers (firms) gain.
- Home collects tariff revenue equal to J + L.
- The overall Home welfare change is +L − K; this net effect may be positive or negative; the relative sizes of L and K depend upon the slopes of the *MD* and *MS* curves and on the size of *T*.
- The global impact of the tariff, adding Home and Foreign welfare changes together, is definitely negative.

### 4.3.3 Tariffs as a way of taxing foreigners

The result that a tariff might make the Home country better or worse off is worth looking at from a different angle. The two parts of Home's net welfare impact, namely, +L − K, represent very different kinds of changes.

- The area L is the 'border price effect', i.e. the gain from paying less for imports

We can also think of it as the amount of the new tariff revenue that is borne by foreigners. This statement requires some explaining. In the real world, the importing firm pays the whole tariff, so one might think that the importing firm bears the full burden of the import tax. This would be wrong. Part of the burden is passed on to Home residents via higher prices. How much? Well, pre-tariff, the domestic price was $P^{FT}$ and post-tariff it is $P'$, so the difference shows how much of the tariff is passed on to Home residents. Since this price hike applies to a level of imports equal to $M'$, we can say that the share of the tariff revenue borne by Home residents is area J. Using the same logic, we see that some of the tariff burden is also passed back to Foreign suppliers. The before-versus-after border price gap is $P^{FT}$ minus $(P' - T)$ and this applies to $M'$ units of imports. So area L is a measure of how much of the tariff revenue is borne by foreigners.

- Area K is the 'trade volume effect', i.e. the impact of lowering imports

Here is the argument. The *MD* curve shows the marginal benefit to Home of importing each unit (see Section 4.2 if this reasoning is unfamiliar to you). Given this, the gap between the *MD* curve and $P^{FT}$ gives us a measure of how much Home loses for each unit it ceases to import. The area of the triangle C is just all the gaps summed giving the change in imports.

- To put it differently, area L represents Home's gain from taxing foreigners while area K represents an efficiency loss from the tariff

Given all this, we can say that if $T$ raises Home welfare, then it does so only because the tariff allows the Home government to indirectly tax foreigners enough to offset the tariff's inefficiency effects on the Home economy. That is, $T$ causes economic inefficiency at Home but $T$ is also a way of exploiting foreigners. Since the exploitation gains may outweigh the inefficiency effects, Home may gain from imposing a tariff.

### 4.3.4 Global welfare effects and retaliation

The global welfare impact is simply a matter of summing up effects; as we saw, it is negative and equal to −K − M.

Put in this way, the possibility that Home might gain from a tariff is clearly suspect. For example, if Home and Foreign were symmetric and both imposed tariffs, both would lose the efficiency triangle K and the gain to Home of L on imports would be lost to Home on its exports to Foreign. Home would also lose the deadweight triangle M on exports, so the net loss to each of the symmetric nations would be −K − M.

In short, protection by all nations is worse than a zero-sum game. It is exactly this point that underpins the economics of WTO tariff-cutting negotiations. If only one nation liberalizes, it might lose. If, however, the nation's liberalization is coordinated with its trading partners' liberalization, the zero-sum aspect tends to disappear.

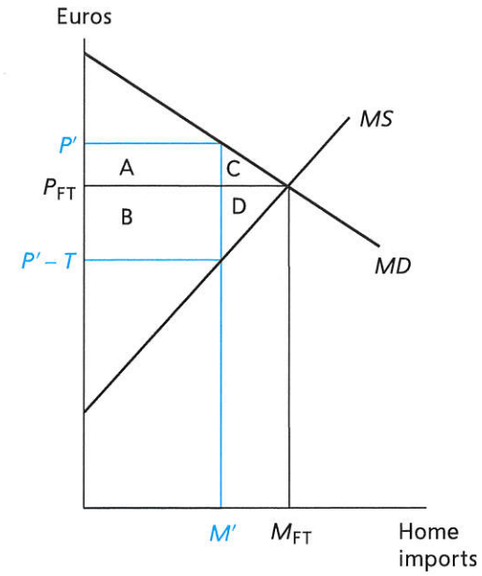
## 4.4 Types of protection: an economic classification

Tariffs are only one of many types of import barrier that European integration has removed. The first phase of EU integration, 1958–68, focused on tariff removal, but the Single Market Programme that was started in 1986 focused on a much wider range of non-tariff barriers.

While there are several methods of categorizing such barriers, it proves useful to focus on how the barriers affect so-called trade rents. A tariff, for instance, drives a wedge between the Home price and the border price (i.e. the price paid to foreigners). This allows someone (in the tariff case it will be the Home government) to indirectly collect the 'profit' from selling at the high domestic price while buying at the low border price. For historical reasons, economists refer to such profits (area A + B in Figure 4.8)



**Figure 4.8** Home welfare effects of import protection




as 'rents'. When it comes to welfare analysis, we must watch the trade rents closely. For some import barriers, Home residents get the rents, but for others no rents are created, or foreigners get them. This distinction is highlighted by distinguishing three categories of trade barrier: domestically captured rent (DCR) barriers; foreign captured rent (FCR) barriers; and 'frictional' barriers. We consider them in turn.

### 4.4.1 DCR barriers

Tariffs are the classic DCR barrier. Here, the Home government gets the trade rents. From a Home nationwide welfare perspective, however, it does not really matter whether the government, Home firms or Home consumers earn these rents, as long as the rents are captured domestically. What sorts of barrier other than tariffs would lead to domestically captured rents? Some forms of quotas are DCR barriers. A quota is a quantitative limit on the number of goods that can be imported per year. To control the number of foreign goods entering the country, the government hands out a fixed number of import licences and 'collects' one licence per unit imported. The price and quantity effects of a quota that restricts imports to $M'$ in Figure 4.8 are identical to the effects of a tariff equal to $T$. The point is that, if imports are limited to $M'$, then the gap between domestic consumption and production can be no more than $M'$, implying that the domestic price must be driven up to $P'$. Another way to say this is that $T$ is the 'tariff equivalent' of the quota. Now consider the trade rents. With a quota, whoever has the licence can buy the goods at the border price $P' - T$ and resell them in the Home market for $P'$. This earns the licence holders A + B. If the government gives the licences to Home residents, then the quota is a DCR barrier. If it gives them to foreigners, the quota is an FCR barrier.

### 4.4.2 FCR barriers

A prime example of an FCR barrier is a 'price undertaking' in the context of an anti-dumping tariff. Under EU law, the Commission can impose a tariff on a non-member nation if that nation's firms are selling goods below cost in the EU market (so-called dumping). In some cases, an anti-dumping tariff is imposed but in other cases no tariff is imposed and the exporting firm promises to raise its price instead. These promises are called 'price undertakings'.

For example, if the agreed level were $P'$ from Figure 4.8, the price undertaking would have the same price and quantity effects as a tariff, $T$. Importantly, however, the undertaking allows foreign producers, rather than the Home government, to garner the rents A + B. Throughout the industrialized world, and in the EU in particular, it is very common for trade barriers to be arranged so that foreigners earn the rents. One reason is that trade rents are used as a kind of gift to soothe foreign companies and governments that are likely to be angered by the imposition of a trade barrier.

Finally, note that an FCR barrier harms EU welfare more than a DCR barrier. Specifically, the welfare cost of an FCR is always negative, i.e. –A – C, instead of being ambiguous, i.e. B – C. Moreover, the foreign welfare impact is now A – D, so an FCR may end up helping foreigners!

### 4.4.3 Frictional barriers

An important type of trade barrier that still remains inside the EU consists of what are sometimes called 'technical barriers to trade' (TBTs). Western European countries often restrict imports by subjecting them to a whole range of policies that increase the real cost of buying foreign goods. Some examples are excessive bureaucratic 'red-tape' restrictions and industrial standards that discriminate against foreign goods. One of the most famous examples is discussed in Box 4.2.

#### Box 4.2 *Cassis de Dijon*: a history-making technical barrier to trade

One very common type of frictional barrier concerns health and safety regulations that have the side effect of hindering trade. Perhaps the most famous of these was a German regulation that forbade the importation of certain low-alcohol spirits, including the sweet French liqueur, Cassis – used in the famous white wine cocktail, Kir. This regulation was challenged before the EU's Court of Justice as a barrier to trade. When challenged on this regulation, the German government argued that the prohibition was necessary to protect public health (since weak spirits more easily promote alcohol tolerance) and to protect consumers (since consumers might buy weak spirits, thinking they were strong). In 1979, the Court ruled that the measure was not necessary since widespread availability of low-alcohol drinks (e.g. beer) in Germany made the prohibition ineffective in furthering public health. It also found that putting the alcohol content on the label was sufficient to protect consumers, so the import ban was not necessary for their protection. This Court ruling resulted in the frictional barrier being removed. More importantly, it established the basic principle known as 'mutual recognition' whereby goods that are lawfully sold in one EU nation shall be presumed to be safe for sale in all EU nations. Exceptions to this principle require explicit motivation. By the way, the formal name for this Court case is *Rewe-Zentral AG v Bundesmonopolverwaltung für Branntwein*; no wonder it's called *Cassis de Dijon*.

Since frictional barriers are bad for a nation, one may ask why they are so prevalent. Box 4.3 provides one explanation.

#### Box 4.3 Why do frictional barriers arise so often?

Government agencies charged with formulating and enforcing standards are often 'captured' by special-interest groups from the regulated industries. Moreover, the Home firms that are to be subjected to the standards often play an important role in setting the standards. For example, when regulating a highly technical field such as elevators, the government (which probably does not employ many full-time elevator experts) naturally asks the opinions of domestic firms that produce elevators. With an eye to their foreign competitors, they quite naturally push for standards that raise the cost of imported goods more than the cost of locally produced goods.

An example can be found in the paper industry. Sweden and Finland produce paper mainly from new trees, while French and German paper producers use a lot of recycled paper and rags. In the early 1990s, the EU was considering a regulation that would require all paper sold in the EU to contain a certain fraction of recycled paper. This sounds like a 'public interest' regulation. However, it also would have had the effect of eliminating the resource-based advantage of Swedish and Finnish firms, much to the joy of French and German firms. In other words, it would have raised the real cost of imports (since the Nordic producers would have had to switch to less efficient techniques). As it turns out, it is not clear which production method is 'greener'. Recycling paper requires lots of chemicals that may be released into the environment, while establishing more tree farms is, well, green – a point that was not raised by French and German paper producers.

As a result of Finland and Sweden joining the EU, the regulation was not adopted, but this shows the subtle mixing of public interest and protectionism that inevitably arises when nations adopt regulations and standards. Of course, nations do need health, safety, environmental and industrial standards, so we cannot eliminate frictional barriers by simply abolishing all regulation. This is one of the issues tackled by the EU's 1992 programme.

One important class of frictional – i.e. cost-creating – barriers involves industrial and health standards that are chosen at least in part to restrict imports. For example, some countries refuse to accept safety tests that are performed in foreign countries, even in highly industrialized nations. This forces importers to retest their products in the local country. Beyond raising the real cost of imported goods, this sort of barrier delays the introduction of new products. While this clearly harms consumers, Home producers may benefit since it may give them time to introduce competing varieties. Another example involves imposing industrial, health, safety or environmental standards that differ from internationally recognized norms. It is often difficult to know objectively whether an unusual regulation or standard represents a valid 'public interest' concern or whether it is just a protectionist device. In fact, both motives are usually behind the adoption of such measures.

Regardless of why such policies are adopted, they have the effect of protecting Home producers or service providers. Home firms design their products with these standards in mind, while foreign firms, for whom the Home market may be relatively unimportant, are unlikely to do so. Bringing imported products into conformity raises the real cost of imports.

For example, all cars sold in Sweden must have wipers for the headlights. While this policy may have some merit as a safety regulation (in the old days Sweden had lots of dusty rural roads), it also has the effect of raising the price of imported cars more than it raises the price of Swedish cars. From the drawing board onwards, all Volvo and Saab models – and their production facilities – are designed with these headlight wipers in mind. For other car makers, take Renault as an example, the Swedish market is far too small to really matter. The design of Renaults and Renault's mass production facilities are not optimized for the installation of headlight wipers. Consequently, while it is expensive to put headlight wipers on both Swedish and French cars, it is much more so for French cars. This gives the Swedish car makers an edge in Sweden. Similar sorts of barrier give the French an edge in their domestic market.

## 4.5 Sources of competitiveness differences

The diagrams in Section 4.3 assumed that the two nations incurred different costs when producing the good whose quantity appears on the horizontal axis (see Figure 2.7, for example). But where do such cost and price differences come from?

A major part of international trade theory is concerned with exactly this question. In that literature it is called the question of 'sources of comparative advantage'. This section introduces some basic notions of comparative advantage theory to help readers understand the real-world sources of these price differences.

### 4.5.1 Traditional comparative advantage made simple

Comparative advantage analysis starts with a sector-by-sector comparison of the competitiveness of individual nations. To structure our thinking about sectoral competitiveness, it is useful to focus on a simplistic notion of competitiveness – one where cheaper means more competitive. To keep things simple, we brush aside all cost considerations apart from labour productivity and wages. The Home nation's cost of producing a particular good is the number of hours required to produce and sell one unit of the good and Home's wage.

For example, if it takes workers in a UK factory a total of 7 hours to produce an electric fan, and the UK wage is, say, 5 GBP per hour, then the fan costs 35 GBP. Under the assumption of perfect competition, the price on the market would be 35 GBP. Suppose the same electric fan takes 20 hours to make in an Italian factory (since Italian factories are less productive in this example), and the Italian wage is 12 euros an hour, the Italian-made fan would cost 140 euros.

Which fan is cheaper? The answer depends upon the exchange rate, i.e. the number of euros per pound. If the exchange rate (EUR/GBP) is 2.00 euros per pound, then converting the GBP price to euros implies that the British-made fan would cost 70 euro – cheaper than the 140 euro price of the Italian-made fan. This is what we mean when we say Britain is more competitive than Italy in terms of fans.

The same sector-by-sector comparison is made for four goods in Table 4.1, namely, electric fans, espresso machines, jet engines, and designer silverware. In each case, illustrative hours-per-unit are listed for the two nations. To calculate prices, the table also includes the two nations' wages, and an illustrative exchange rate. The British wages are converted from pounds to euros for the calculation. The second- and third-to-last columns show the calculated prices. The final column shows the ratio of the Italian price to the UK price (both in euros).

**Table 4.1** Example of sector-by-sector competitiveness

| | Hours needed in: | | Wages (local currency) | | Exchange rate | Wages in euros | | Prices in euros | | Price ratio |
|---|---|---|---|---|---|---|---|---|---|---|
| | UK | Italy | UK (GBP) | Italy (EUR) | EUR per GBP | UK | Italy | UK | Italy | Italy/ UK |
| Electric fan | 7 | 20 | 5 | 12 | 2 | 10 | 7 | 70 | 140 | 2.000 |
| Espresso machine | 10 | 13 | 5 | 12 | 2 | 10 | 7 | 100 | 91 | 0.910 |
| Jet engine | 1300 | 3000 | 5 | 12 | 2 | 10 | 7 | 13,000 | 21,000 | 1.615 |
| Designer silverware | 23 | 15 | 5 | 12 | 2 | 10 | 7 | 230 | 105 | 0.457 |

#### *Sources of sector-by-sector competitiveness*

The relative price is a measure of the UK's competitiveness sector by sector because, when the Italian price is high compared to the British price, it is the UK good that is more competitive. It is instructive to think about the relative price (e.g. 140/70) in a slightly different way. To start with, observe that the relative price depends upon two things:

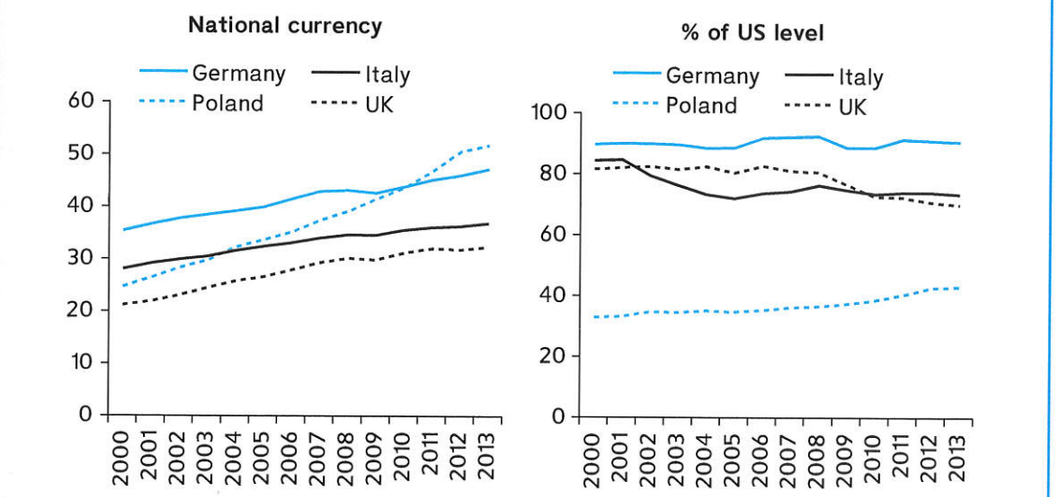
- relative labour productivity (i.e. hours needed in Italy over hours needed in the UK);
- relative wages measured in a common currency.

Relative productivity is something that changes quite slowly as it depends upon the nations' industrial histories, general level of scientific and technological know-how, management efficiency and experience in making the goods concerned – to mention just a few factors.



Figure 4.9 shows some actual numbers for the UK and Italy, and Germany and Poland for comparison. Specifically, labour productivity is here measured as total GDP divided by total hours worked. Since 2000, all of these have risen in national currency terms (the left-hand panel of Figure 4.9). The German and Italian numbers show GDP measured in euros. Plainly, workers in German factories are more productive and this is the main reason wages are higher in Germany than Italy. Both sets of workers have seen increasing productivity and this underpins the ability of industry to raise wages every year without losing competitiveness. The UK numbers show GDP per hour worked in pounds and the Polish in zlotys, so they cannot actually be compared directly to the euro-based numbers.

**Figure 4.9** Labour productivity measures: the UK, Germany, Italy and Poland




*Source:* OECD online data, http://stats.oecd.org/

The right-hand panel of Figure 4.9 shows the labour productivities (i.e. GDP per hour worked) converted to a common basis (US dollars) and then compared to US productivity. What it shows is that Germany has maintained its labour productivity at about 90 per cent of the US level since 2000. The UK and Italy, by contrast, have seen a significant decline. Poland, while starting at a much lower level than the other three, is clearly catching up. Again, this is the main reason Polish wages and incomes are rising much faster than those in western Europe.

The relative wage also moves. But what is the 'right' relative wage? The answer is that the relative wages adjust to ensure that Italy and the UK, or both, are competitive in some sectors but not all. Returning to the illustrative example, Figure 4.10 facilitates the discussion. The dark bars in the chart plot the relative price numbers for the four goods listed in the last column of Table 4.1, when we took the relative Italian-to-UK wage (measured in euros) to be 7/10. The line at 1.0 is relevant since if the bar is above this, the UK is the lower-cost producer (i.e. competitive in the sector). If the bar is below 1.0, Italy is the one that is competitive in the sector (i.e. the low-cost producer). When the relative wage is 7/10 as assumed in Table 4.1, each nation is competitive in two sectors.

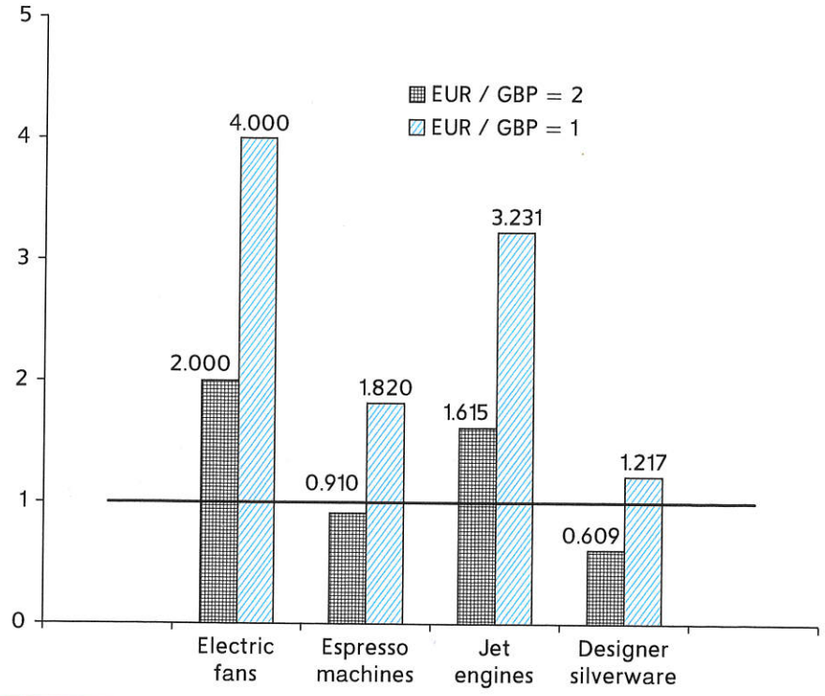
Now consider what the situation would look like if the exchange rate were 1.0 euros per GBP. Before turning to calculations, think about what this would do to the relative competitiveness of Italy and the UK. If wages remained constant in local terms (euros and pounds), then the exchange rate change (from 2 euros to 1 euro per point) would raise the relative price of Italian labour. Or looking at it from the British perspective, it would make UK wages appear to fall – relative to Italian wages – by 50 per cent, namely, from 10 to 5 euros. Plainly, this will tend to improve UK competitiveness in all sectors.

To identify the degree of change, we can re-do the price calculations using this simple formula:

$$\frac{\text{Italian price}}{\text{UK price}} = \frac{\text{Italian hours needed}}{\text{UK hours needed}} \times \frac{\text{Italian wage (€)}}{\text{UK wage (£)}} \times \frac{1}{\text{€'s per £}}$$

The answers are listed above the light bars in Figure 4.10 (diligent readers should work this out for themselves). The results show that Italy would be uncompetitive in all sectors at this 1.0 exchange rate. Surely this is not an equilibrium because it would mean that Italy imports everything and exports nothing.

**Figure 4.10** Illustration of the relative wage that balances competitiveness




The real-world mechanisms for arriving at the equilibrium relative wage are complex. Explaining them would fill a few more chapters. But even without a full understanding, our simple 'thought experiment' serves to elucidate the basic considerations. If Italian workers are too expensive relative to UK workers – taking into account their relative productivity – then Italy would have no exports to pay for its imports. In equilibrium, the relative wage will adjust so that each nation is competitive in some sectors. When exchanges rates can move – as is the case for the EUR/GBP rate – then some of the adjustment can come from changes in the number of euros to the pound. When exchange rates are locked-in – as they are among the Eurozone nations – the only way to adjust national competitiveness is to change wages directly. Doing so can be painful, as the recent Eurozone crisis has shown.

### 4.5.2 Other sources of competitiveness

The simple illustration above looks only at labour productivity and the price of labour (i.e. the wage). In reality, many other things affect the competitiveness of goods -- product quality and reliability, for example. These help explain why most Europeans will pay more for a Volkswagen than they will for a similar car



made by Renault. Quality and reliability themselves are the outcome of complex factors and interactions among these factors. Since quality is hard to measure and hard to change, simple microeconomics typically ignores it by assuming that only prices matter.

Another example is the cost of other inputs such as energy. This competitiveness factor has been in the news recently due to big changes in the US shale gas and oil industry. The rapid growth in shale gas output has pushed down natural gas prices in the USA. This has helped the competitiveness of sectors that use a lot of these inputs. A 2014 VoxEU.org column (Mathieu et al., 2014) discusses how this development has shifted US sector-by-sector competitiveness. In sectors like plastics and nitrogen fertilizers – for which oil and gas represent 25 to 40 per cent of total costs – the lower price of this input has massively boosted US sectoral competitiveness. Other inputs such as managers, skilled technicians, engineers and software programmers can also vary in price across nations and vary in importance by sector and so these too are considered important sources of comparative advantage.

### 4.5.3 Summary

The partial equilibrium diagrams in the rest of the chapter take the competitiveness of Home and Foreign as given. Specifically, national competitiveness is reflected in the relative heights of the domestic supply curves (recall that these are really the marginal cost curves so a higher supply curve means higher costs). This section provides a rationale for why some nations will be more competitive in some sectors while other nations will be competitive in others.

The bottom-line insight is simple. For many reasons, the sectoral profiles of national costs differ across nations. Some nations are really good at engineering goods, others in design-intensive goods, and yet others in labour-intensive goods. Given these different cross-sector, national profiles, relative wages adjust so that each nation is cost-competitive in some sectors but not all.

## 4.6 Summary

This chapter presented the essential microeconomic tools for trade policy analysis in the simplified world in which we assume there is no imperfect competition and no scale economies. The two most important diagrams are the open-economy supply and demand diagram (right-hand panel of Figure 4.5) and the *MD–MS* diagram (left-hand panel of Figure 4.5). The *MD–MS* diagram provides a compact way of working out the impact of import protection on prices, quantities and overall Home and Foreign welfare. The open-economy supply and demand diagram allowed us to consider the distributional impact of import protection, i.e. to separate the overall effect into its component effects on Home consumers, Home producers and Home revenue.

The chapter also discussed types of trade barrier in Europe and classified them according to what happens to the trade 'rents'. Under the first type, DCR barriers, the rents go to domestic residents; with FCR barriers, the rents go to foreigners; and with frictional barriers, the rents disappear. European integration consisted primarily of removing DCR barriers up until the mid-1970s. Subsequent goods-market liberalization has focused on frictional barriers.

The final topic was a quick introduction to the intuition behind the sources of comparative advantage, i.e. the reasons why nations are competitive in some but not all sectors.

### Self-assessment questions

1 Using a diagram like Figure 4.8, show the full Foreign welfare effects of imposing a Home tariff equal to $T$, i.e. show the impact on Foreign producers and Foreign consumers separately.

2 In August 2005, EU clothing retailers such as Sweden's H&M complained about the new EU restrictions on imports from China that were imposed after complaints from clothing producers based in Italy, France, Spain, Portugal and Greece. Use a diagram like Figure 4.8 to explain the positions of the various EU interest groups.

3 One way to think about the slope of the *MS* curve is in terms of the 'size' of the home nation. The idea is that the demand from a very small nation has a very small impact on the world price. For example, Switzerland could probably increase its oil imports by 10 per cent without having any impact on the world oil price. Using a diagram like Figure 4.7, show that the welfare costs of imposing an MFN tariff are larger for smaller nations, interpreting this in terms of the *MS* curve's slope. Show that when the *MS* curve is perfectly flat, the welfare effects are unambiguously negative.

4 Using a diagram like Figure 4.8, show that a country facing an upward-sloping *MS* curve can gain – starting from free trade – from imposing a sufficiently small tariff. (Hint: Starting from a small tariff, the rectangle gains and triangle losses both increase in size as the tariff gets bigger, but the rectangle gets bigger faster.) Show that any level of a frictional or FCR barrier lowers Home welfare.

5 Using the results from the previous exercise, consider the impact of Home imposing a tariff on Foreign exports and Foreign retaliating with a tariff on Home's exports. Assume that the *MS* and *MD* curves for both goods (Home exports to Foreign and Foreign exports to Home) are identical. Starting from a situation in which Home and Foreign both impose a tariff of $T$, show that both unambiguously gain if both remove their tariffs, but one nation might lose if it removed its tariff unilaterally. By the way, this exercise illustrates why nations that are willing to lower their tariffs in the context of a WTO multilateral trade negotiation are often not willing to remove their tariffs unilaterally.

6 Using a diagram like Figure 4.5, show that an import tariff equal to $T$ has exactly the same impact on prices, quantities and welfare as a domestic consumption tax equal to $T$ and a domestic production subsidy equal to $T$. (Hint: A production subsidy lowers the effective marginal cost of domestic firms and so lowers the domestic supply curve by $T$.)

7 Using a diagram like Figure 4.7, show the impact on quantities, prices and welfare when Home has no tariff but Foreign charges an export tax equal to $T$.

8 Using a diagram like Figure 4.5, show the impact on quantities, prices and welfare when Home has no tariff but Foreign imposes an export quota with a tariff-equivalent of $T$.

9 Using a diagram like Figure 4.7, show that the welfare effects of a quota that restricts imports to $M'$ are exactly the same as a tariff equal to $T$; assume that each quota licence (i.e. the right to import one unit) is sold by the government to the highest bidder.

## Further reading: the aficionado's corner

Every undergraduate textbook on international economics has a chapter on tariff analysis that covers the same material as this chapter. One particularly accessible treatment can be found in:

**Krugman, P. and M. Obstfeld** (2005) *International Economics*, 7th edition (or earlier), HarperCollins, New York.

For much more on the economics of trade protection, see:

**Vousden, N.** (1990) *The Economics of Trade Protection*, Cambridge University Press, Cambridge.

### *Useful websites*

The World Bank's website provides extensive research on trade policy analysis. This includes many papers on non-discriminatory trade policy but also a very large section on preferential trade arrangements under the heading of 'regionalism'. See www.worldbank.org.

The Commission's website on trade issues can be found at http://ec.europa.eu/trade/. It has lots of information on the latest changes to EU trade policy.

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Chapter

*[T]he ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else. Practical men, who believe themselves to be exempt from any intellectual influences, are usually the slaves of some defunct economist.*

**John Maynard Keynes, 1935**

# The essential economics of preferential liberalization

## Chapter Contents