

## Chapter 5

### THE GAINS FROM TRADE

#### 5.1 Gains from trade

We are now in a position to address one of the most fundamental issues in the study of international trade: the gains from trade. We will be able to show that under certain circumstances a country's overall welfare is in some sense improved by international trade, which should thus be viewed as desirable. We will show that, under a wide range of circumstances, all countries mutually gain from trade; that is, trade is a "positive-sum game".

However, we will also show that not all individuals within a country will necessarily benefit from trade. In other words, while a country's total income is increased by trade, these gains may be very unevenly distributed to the point where some individuals or groups are worse off. A correct understanding of the gains from trade is thus important not only from an academic point of view, but also because of the practical need to evaluate various anti-trade arguments put forward by business, labor, and even government groups.

Figure 5.1 shows the production frontier and indifference curves for a single country. Autarky equilibrium occurs at point A, with the economy reaching utility level  $U^a$ . Figure 5.1 also shows two alternative world trading price ratios,  $p^{*1}$  and  $p^{*2}$ . We have constructed the diagram quite deliberately such that these two world price ratios both lead to the same free-trade utility level,  $U^*$ . Figure 5.1 is not a formal proof, but it illustrates a result that can be proved more rigorously: *the ability to trade at any price ratio other than the country's autarky prices must make the country better off*.

#### Figure 5.1

Another thing to note from Figure 5.1 is that the *direction* of trade is of no particular welfare significance. The utility level  $U^*$  can be achieved either through the export of  $X_2$  in the case of world price ratio  $p^{*2}$  or through the export of  $X_1$  in the case of world price ratio  $p^{*1}$ . The point is only that the world price ratio should differ from the domestic autarky ratio. Given any such difference, the country gains by exporting what is more valuable on world markets than at home and by importing from the rest of the world what is more costly to produce at home than abroad. This is an important point insofar as there are many arguments that attach particular significance (e.g., prestige motives) to what goods a country imports or exports.

Returning to a point made in the first paragraph of this section, it also follows that two countries *mutually* enjoy gains from trade. In Figure 4.5 of the previous chapter, we depict a situation in which two countries have different autarky price ratios and the equilibrium world price ratio is (weakly) between these two autarky price ratios. It thus follows from our analysis of Figure 5.1 that *both countries are (weakly) better off with trade*; the only exception to being *strictly* better off is when the world price ratio is equal to the autarky price ratio of one country, in which case that country is no better off but no worse off with trade. Trade is Pareto improving for both countries.

Figure 5.2 illustrates the point about mutual gains by constructing a special case in which the countries are symmetric, essentially mirror images of one another. The two countries have identical preferences, but different production frontiers. The production frontiers for Home and Foreign are given by  $X_{h2}X_{h1}$  and  $X_{f2}X_{f1}$  respectively. Home is relatively good at producing  $X_1$  while Foreign is relatively good at producing  $X_2$ . This difference is then reflected in their autarky price ratios, Home consuming at  $A_h$  and Foreign at  $A_f$  in Figure 5.2.

Under free trade, both countries specialize in producing only one good in the case shown in Figure 5.2. Free trade allows both of them to reach the same consumption point D at price ratio  $p^*$ , with Home producing at  $X_{h1}$  and Foreign producing at  $X_{f2}$  (each country exports half of the output of its good for half of the output of the other country's good in this symmetric case).

### Figure 5.2

We emphasize that this is a very special case; in general there is no presumption that two countries will reach the same utility level through trade or that the gains from trade will be shared equally. The latter point will be made many times throughout the book. But the points that (A) both countries do gain and (B) the direction of trade is not necessarily of any significance are very general results.

Before moving on, Figure 5.2 can also be used to illustrate a decomposition that is sometimes useful in analyzing trade distortions. This is the decomposition of total gains into (1) gains from exchange and (2) gains from specialization. Suppose our two countries in autarky in Figure 5.2 magically discover each other's existence after production is fixed for the year. They can still trade from their fixed outputs at  $A_h$  and  $A_f$  to reach the common point  $D_e$  ("e" for exchange). This is often referred to as pure gains from exchange: trade from fixed endowments with no change in production. However, they see that there are additional gains from specializing and so next year they produce at  $X_{h1}$  (home) and at  $X_{f2}$  (foreign). Then they can trade to reach the mutual consumption point D in Figure 5.2. The distance between D and  $D_e$  then measures the additional gains from specialization. Of course, there will be no gains from specialization unless exchange is possible.

## 5.2 The gains-from-trade theorem

We will now present a somewhat more formal treatment of the gains from trade, in particular we present a simple proof of what is called the gains-from-trade theorem. This helps make clear the assumptions necessary to ensure that a country gains from trade. In Chapter 2, we showed that a competitive, undistorted economy maximizes the value of final production at world prices. Let superscript '\*' denote quantities produced in free trade and superscript 'a' denote the quantities produced in autarky. Subscript i again indexes goods. From our result in (2.25), we have the following inequality.

$$\sum_i p_i^* X_i^* \geq \sum_i p_i^* X_i^a \quad (5.1)$$

Add in the balance-of-trade condition (4.2) or (4.3) and the autarky market-clearing conditions (4.1).

$$\sum_i p_i^* X_i^* = \sum_i p_i^* D_i^* \quad X_i^a = D_i^a \quad (5.2)$$

Substitute the left-hand equation of (5.2) into the left-hand side of (5.1) the right-hand equations of (5.2) into the right-hand side of (5.1).

$$\sum_i p_i^* D_i^* \geq \sum_i p_i^* D_i^a \quad (5.3)$$

Free-trade consumption is revealed preferred to autarky consumption: this is the gains-from-trade theorem. At free-trade prices, the autarky consumption bundle could have been purchased for the same or less money but wasn't, so the free-trade bundle must be preferred. Another way of stating the theorem is to say that the assumptions of competition in all markets and the absence of other distortions is a *sufficient condition* to ensure that free trade is preferred to autarky. We will return to this point below.

The gains-from-trade theorem is appealing in its simplicity (once 5.1 is proved). But how robust is it to added complications? The following is a list of modifications to the basic model under which the

theorem remains true.

(A) Robust to the existence of trade costs and tariffs: costly trade versus autarky. Trade costs don't matter: we just interpret the prices  $p^*$  as the CIF prices (cost, insurance, freight) at which the country can trade, which are not the prices the foreign partner pays or receives. Tariffs require a more complicated analysis that is postponed until Chapter 18. Trade costs are treated in a number of chapters. The basic result is that increases trade costs and tariffs move the country back toward autarky but cannot make the country worse off than in autarky. This is not true for trade subsidies, discussed in the next section.

(B) Robust to changes in the number of goods produced in free trade versus autarky, robust to the inclusion of intermediate goods and services. Trade may change the set of goods produced relative to autarky. The country may specialize more, producing fewer goods, or new goods and services may be produced as trade creates a demand for things that had no market previously (think of stories about the off-shoring of services in recent years). We noted in Figure 2.12 that the production efficient condition underlying gains from trade certainly covers cases where fewer goods are produced. But it certainly covers the case of more goods as well. Think of the set of  $i$  goods in (5.1) as including the set of all possible goods, some of which might not be produced in trade or in autarky. The proof that we had of production efficient in Chapter 2 is valid. For a good produced in autarky but not under trade, the left-hand side of (2.22) is zero, no production, and the right-hand side is negative (production is unprofitable at free-trade prices). For a good produced in free trade but not autarky, the left-hand side of (2.22) is zero, profits are zero, and the right-hand side is also zero: there is no production in autarky. Discussion of traded intermediate goods and services is postponed until Chapter 15.

(C) Robust to changes in the number of goods consumed in free trade versus autarky. We will note several times in the book that trade allows for new goods and services to be consumed. The gains-from-trade theorem is not invalidated by this. Consider an economy that is endowed with a single good (or a small number of goods, no variation in production possible). With trade, it is feasible for consumers to choose not to trade and continue their autarky consumption. If they choose to trade some of their endowment for new goods, this must be welfare superior since they are not choosing the alternative, feasible option of autarky.

(D) For small countries, free trade is superior to any level of trade restrictions and/or subsidies. For an undistorted small economy facing fixed prices, it is possible to show that completely free trade is superior to any level of trade taxes and/or subsidies. We will show this in Chapter 18.

### 5.3 Limitations of the gains-from-trade theorem

Unfortunately, there are many other generalizations of the basic underlying model that invalidate the theorem. Here is a list, all of which are dealt with in more detail later in the book.

(A) Not robust to trade subsidies: subsidized trade versus autarky. Trade restrictions cannot make the country worse off than in autarky, but subsidies to trade can. We will show this in Chapter 18.

(B) Not robust to domestic distortions: "free" trade versus autarky. Domestic distortions within the economy such as taxes, subsidies, imperfect competition and externalities generally invalidate the theorem, and we will show this at a number of points in the book. However, we must emphasize that the basic gains-from-trade theorem say competition and the absence of other distortions is a *sufficient* condition for gains, not a *necessary* condition. We will show at several points that imperfect competition and increasing returns to scale offer important sources of gains from trade, so gains may be larger when these features are present even though the theorem itself cannot be proven.

In order to get a flavor of the problem, consider imperfect competition in industry  $i$  (a monopolist will do) and refer back to (2.22). This inequality is implied by profit maximization for competitive, price-taking firms, but not necessarily for a monopolist. As we know from basic microeconomics, a

monopolist reduces quantity in order to raise price relative to a competitive outcome. Suppose that the output  $X_i^0$  and inputs  $V_{ij}^0$  are observed to be chosen by the monopolist with resulting prices  $p^0$  and  $w^0$ . It will generally be true that there is an alternative feasible output/input combination  $X_i^1$  and  $V_{ij}^1$  that generates higher profits *holding those prices constant*. However, the monopolist knows if the firm *actually chooses* output  $X_i^1$  and inputs  $V_{ij}^1$  then the *actual equilibrium* prices will *not* be  $p^0$  and  $w^0$ , but will be some other values  $p^1$  and  $w_j^1$ ; e.g., a higher output of  $X_i^1 > X_i^0$  will depress its price  $p_i^1 < p_i^0$  sufficiently that profits fall. Inequality (2.22) might be replaced by

$$\left[ p_i^0 X_i^1 - \sum_j w_j^0 V_{ij}^1 \right] > \left[ p_i^0 X_i^0 - \sum_j w_j^0 V_{ij}^0 \right] > \left[ p_i^1 X_i^1 - \sum_j w_j^1 V_{ij}^1 \right] \quad (5.4)$$

Following through the same steps as in (2.22) to (2.25) on the first two inequalities assuming that the other industries are competitive, we would then arrive at:

$$\sum_i p_i^0 X_i^1 > \sum_i p_i^0 X_i^0 \quad (5.5)$$

The monopoly equilibrium does not maximize the value of output at equilibrium prices. Similar problems arise with domestic taxes and subsidies, and externalities.

(C) Not robust to trade barriers for large economies: restricted trade versus free trade. The comparison of free or restricted trade to autarky is important for theory, but rarely the actual choice faced by policy makers. Generally, they are choosing between more and less restricted trade. As we noted above, completely free trade is optimal for small economies. But large economies may have some monopoly power in trade, the ability to alter world prices. Some level of trade restrictions might improve prices such that the country is better off. An analysis of this point is postponed to Chapter 18.

## 5.4 The distribution of gains between countries

If the assumptions of the gains-from-trade theorem hold for all countries, then all countries are assured of mutual gains, or at least of being no worse off than in autarky. But the theorem says nothing about the size of gains, and in particular the distribution of total gains between countries. Trade makes the welfare pie bigger, but how is that added benefit divided?

The situation is captured in a simple way in Figure 5.3, where the Edgeworth box gives the endowment point as E, indicates that country h is endowed with the total world supply of good  $X_1$  and country f is endowed with the total world supply of good  $X_2$ . The two indifference curves through the endowment point give the autarky utility of the two countries,  $U_h^a$  and  $U_f^a$ , with autarky price ratios given by the slopes of the indifference curves through these points,  $p_h^a$  and  $p_f^a$ . Trading to any point within the “lens” formed by these two indifference curves is Pareto superior to autarky, and the locus BAC of tangency points is the set of Pareto optimal outcomes. However, there are infinitely many Pareto optimal outcomes and they differ in the distribution of the total gains between the two countries. Point A has a relatively even distribution. Point B awards all gains to country f, with country h indifferent between trade and autarky. Point C awards all gains to country h.

**Figure 5.3**

In a situation where the two countries are just two individuals, an economist would first think of this as a bargaining problem between the two individuals: they try to negotiate over the division of the

total surplus. In a situation where there are many buyers and sellers in each country, this indeterminacy is resolved anonymously via market supplies and demands. We can think of the slope of a ray from E through B, A, or C as the world relative price ratio  $p = p_1/p_2$ . As we pointed out in the first section of this chapter, a country gets larger gains the further the world price ratio is from its autarky price ratio, the slope of its indifference curve at the autarky point. We will say more about this in Chapter 7, when we point out the role of country size in determining this distribution of gains between countries.

## 5.5 The distribution of gains within countries I: heterogeneous preferences

The preceding sections have shown that a country will gain from international trade in the sense that the country can potentially consume more of both goods. The gains were illustrated with the use of community indifference curves, although such indifference curves are not necessary for the main argument. But while trade may result in aggregate consumption gains, it is important in understanding certain trade policy questions to emphasize that the gains from trade are not necessarily distributed evenly among members of a society. Indeed, it is possible that certain groups will actually be worse off in a situation of free trade than in an autarky or a restricted trade situation.

One possibility occurs when individuals in a society have very different tastes. Suppose that all individuals in the society have identical factor endowments and so they have identical incomes and budget lines. Suppose that the world price ratio exceeds the price ratio that would prevail in autarky ( $p^* > p^a$ ) so that the country exports  $X_1$  and imports  $X_2$  (as in Figure 5.1 with  $p^* = p^{*1}$ ). Consider now two individuals with different tastes (but identical incomes). Let  $AA'$  be the identical autarky budget line for each of these two individuals in Figure 5.4. Individual 1 has a high preference for  $X_1$  and so chooses his autarky consumption bundle  $A_1$ . Individual 2 has a high preference for  $X_2$  and therefore chooses bundle  $A_2$ . Their utility levels are given by  $U_1^a$  and  $U_2^a$ , respectively.

### Figure 5.4

As shown in Figure 5.1 ( $p^{*1} > p^a$ ) and Figure 5.4, trade has the effect of raising the relative price of  $X_1$ , which we illustrate in Figure 5.4 by rotating the budget line to  $TT'$ . Individual 1 increases his consumption from  $A_1$  to  $T_1$  and experiences an increase in welfare from  $U_1^a$  to  $U_1^*$ . But the increased price for  $X_1$  has affected individual 2 so adversely that his consumption falls from  $A_2$  to  $T_2$  and his welfare from  $U_2^a$  to  $U_2^*$ . Thus when individuals have heterogeneous tastes, the gains from trade will be distributed unevenly and some groups may indeed become worse off.

## 5.6 The distribution of gains within countries II: heterogeneous endowments

A second example of uneven distribution of gains from trade occurs when individuals differ widely in their endowments of goods and/or factors. To keep it simple here, suppose that workers can either produce a unit of  $X_1$  or  $X_2$  but not both. Suppose that country h has lots of  $X_1$  workers few  $X_2$  workers and vice versa for country f. The situation is shown in Figure 5.5, where  $X_h$  and  $X_f$  are the fixed production points of countries h and f respectively, and both enjoy the same level of autarky utility  $U^a$ .

### Figure 5.5

Now suppose the countries can trade and that the market outcome is that they trade to the mid-point D between  $X_h$  and  $X_f$  (production cannot change by assumption). Both countries share equally in gains from trade. However, relative prices of course change, with trading price ratio  $p^*$  in between the autarky price ratios  $p_h^a$  and  $p_f^a$ .

This price change has important income-distribution consequences. Figure 5.6 shown the effect on the budget line and welfare of a “minority”  $X_2$  producers in country h, the one with lots of  $X_1$  producers. The  $X_2$  producer’s budget line is anchored on the  $X_2$  axis by his/her endowment at point A in Figure 5.6. The effect of trade as shown in Figure 5.6 is to steepen or rotate the budget line through A in Figure 5.6. The minority  $X_1$  producer in country h is worse off by what is an adverse price change for that individual. Figure 5.7 shows the same outcome for a minority  $X_1$  producer in country f. That producer’s budget line is anchored by A in Figure 5.7, and flattens out as a consequence of trade. The minority  $X_1$  producer is worse off by an adverse price change even though it benefits the majority  $X_2$  producers.

**Figure 5.6**

**Figure 5.7**

## 5.7 Summary: what you should know

In this chapter we argue that trade is not a zero-sum game, but a positive-sum game. One country does not gain at the expense of another, there are mutual gains from trade. Yet conditions have to be met to be guaranteed that gains are captured in practice. We show that the assumptions that an economy was competitive and undistorted are needed to prove a simple gains-from-trade theorem. The ability to trade at any prices other than the country’s autarky prices makes an economy strictly better off.

Yet while trade increases a country’s aggregate welfare or, in the worst case, leaves it unchanged, there are still important questions about the distribution of gains from trade both between trading partners and within individual countries. Between countries, there are many possible trades that are Pareto optimal, but have very different distributions of the total gains. In market economies, this is essentially determined by market forces and in Chapter 7 we will see how country size influences this issue. Within countries, the gains can be very unevenly distributed and indeed some households can certainly lose. We noted how this can occur if households have different tastes or different endowments of goods and/or factors. This will be very important later on in understanding the politics of trade policy, and why some groups will oppose liberalization or lobby in favor of protection from foreign competition despite the fact that free trade maximizes overall national income and welfare.

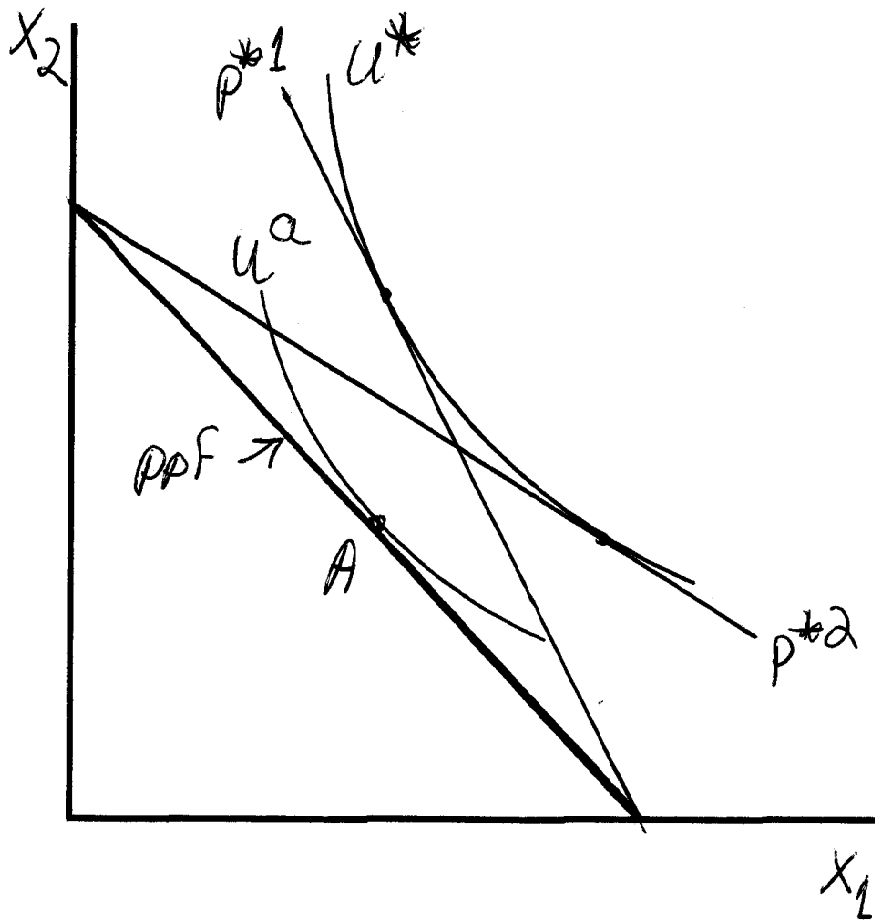


Figure 5.1

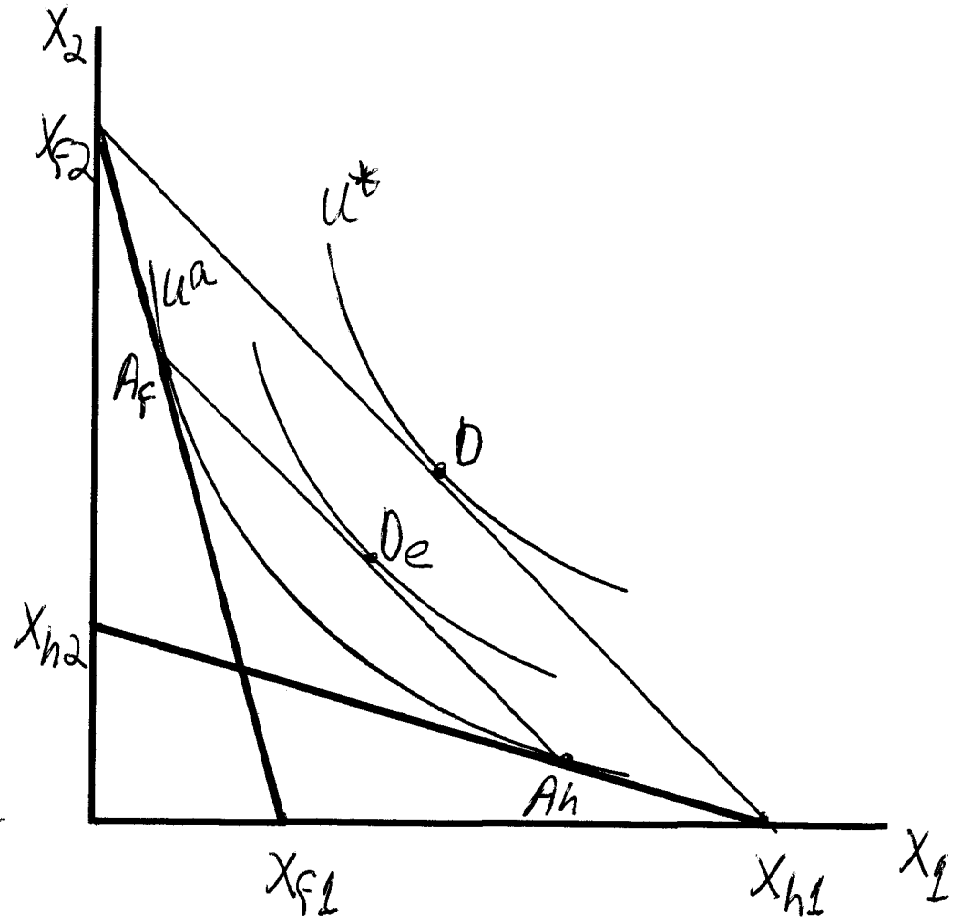


Figure 5.2

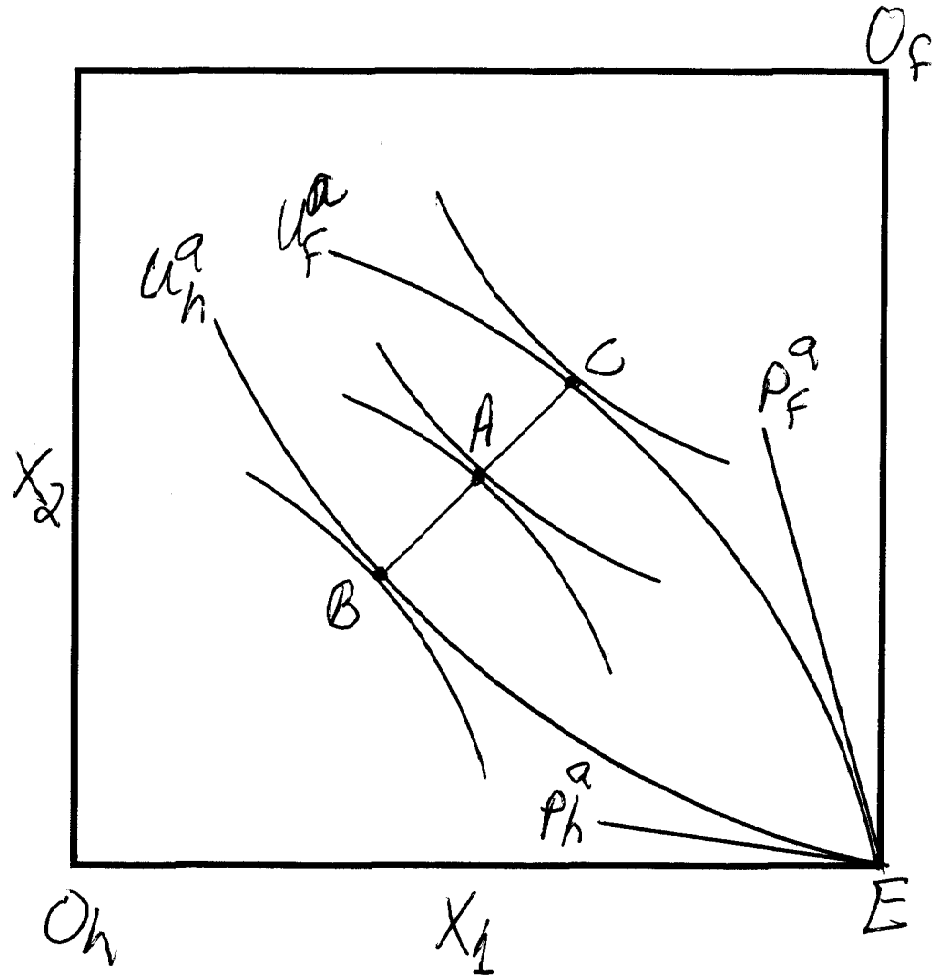


Figure 5.3

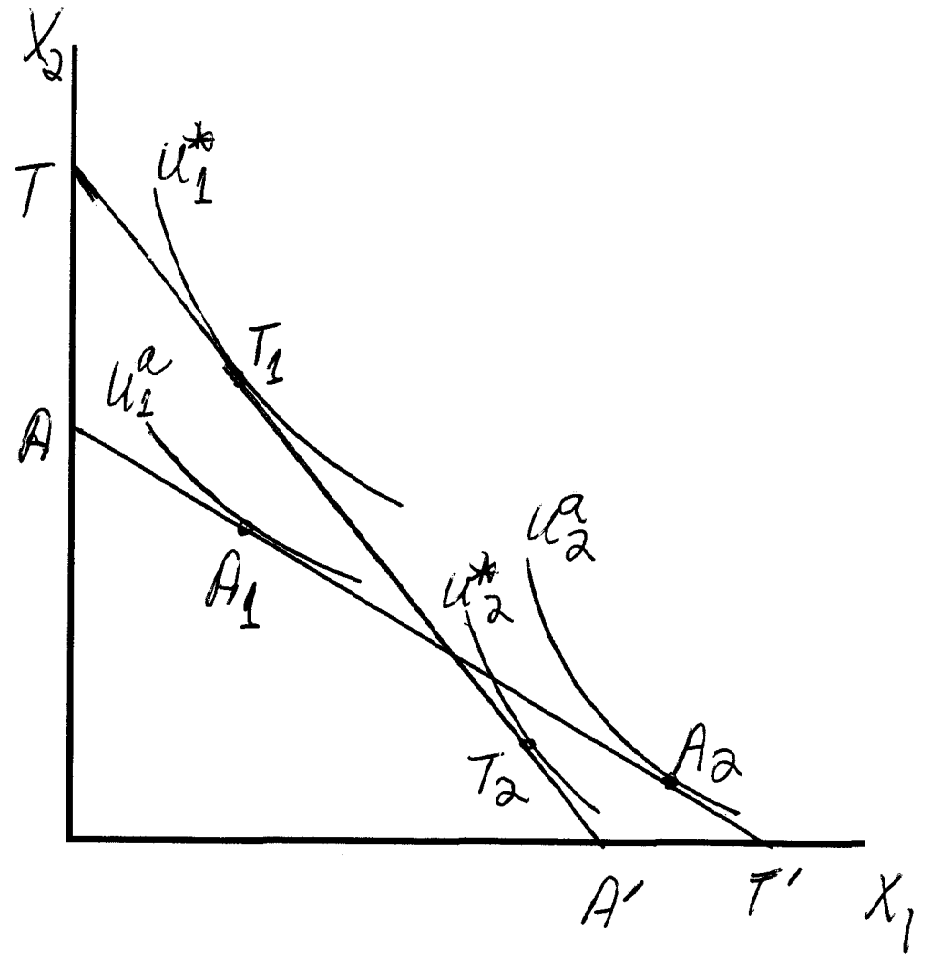


Figure 5.4

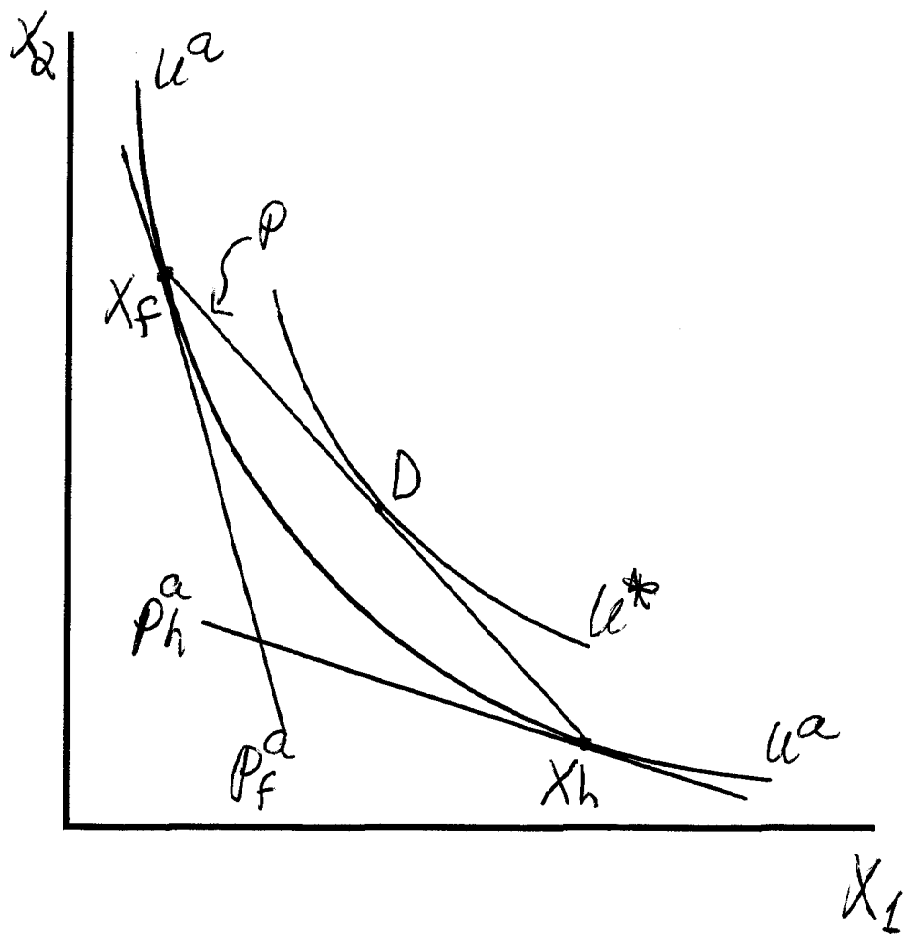


Figure 5.5

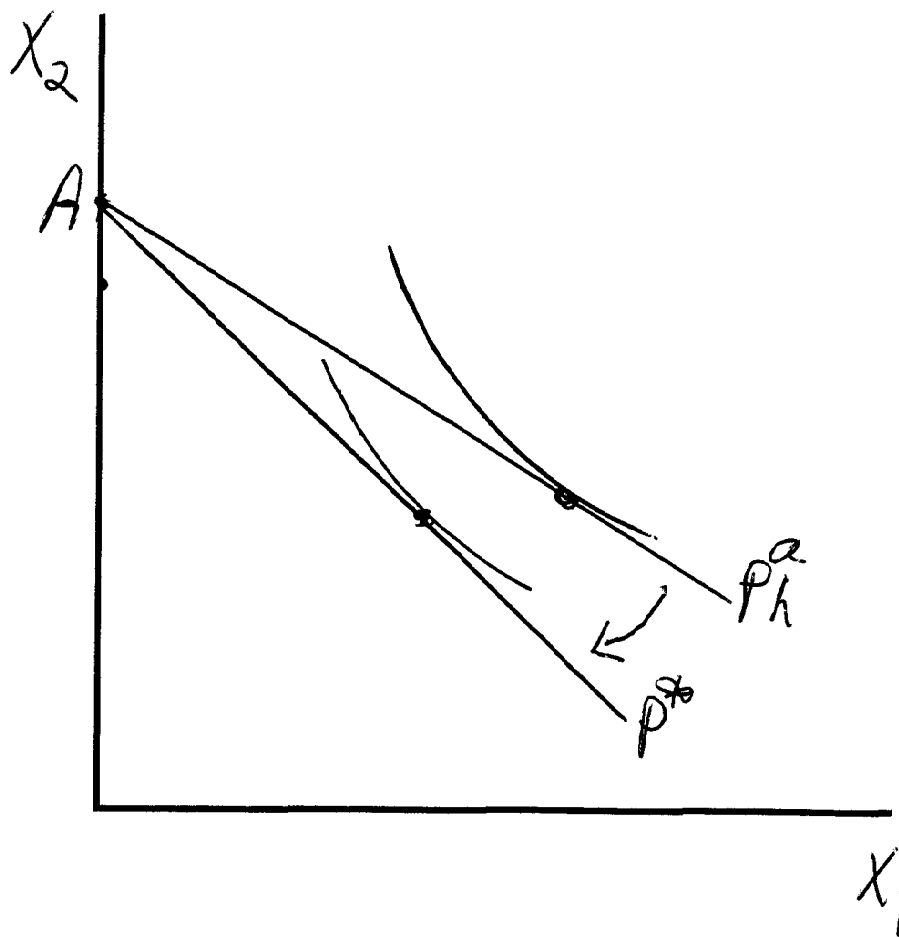


Figure 5.6

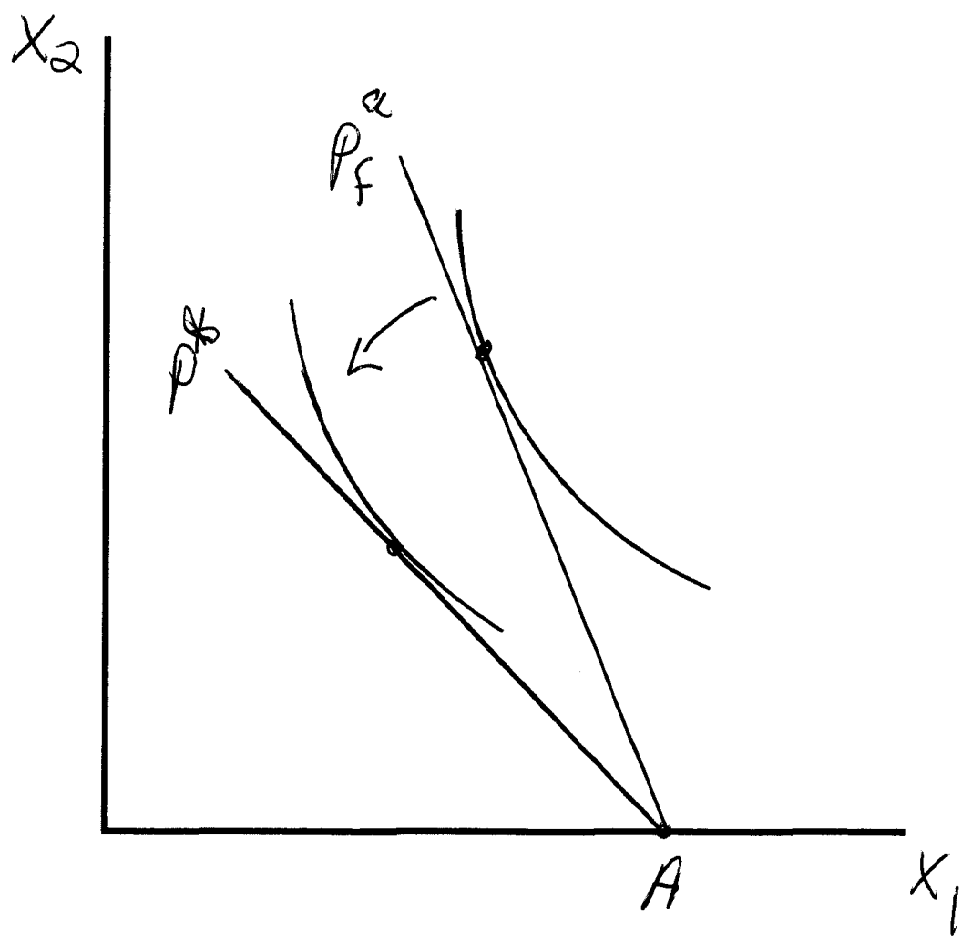


Figure 5.7