There is a useful relationship between relative prices and output that emerges clearly from this analysis of labor allocation; this relationship applies to more general situations than that described by the specific factors model. Equations (4-4) and (4-5) imply that

$$MPL_C \times P_C = MPL_F \times P_F = w$$

or, rearranging, that

$$-MPL_F/MPL_C = -P_C/P_F. \tag{4-6}$$

The left side of equation (4-6) is the slope of the production possibility frontier at the actual production point; the right side is minus the relative price of cloth. This result tells us that *at the production point, the production possibility frontier must be tangent to a line whose slope is minus the price of cloth divided by that of food.* As we will see in the following chapters, this is a very general result that characterizes production responses to changes in relative prices along a production possibility frontier. It is illustrated in Figure 4-5: If the relative price of cloth is $(P_C/P_F)^1$, the economy produces at point 1.

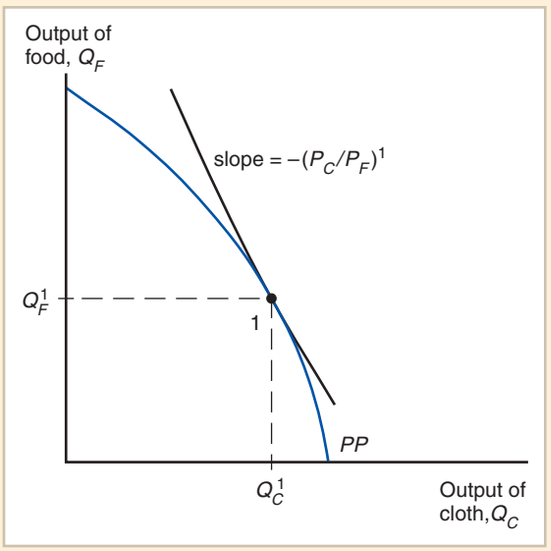
What happens to the allocation of labor and the distribution of income when the prices of food and cloth change? Notice that any price change can be broken into two parts: an equal-proportional change in both P_C and P_F, and a change in only one price. For example, suppose that the price of cloth rises 17 percent and the price of food rises 10 percent. We can analyze the effects of this by first asking what happens if cloth and food prices both rise by 10 percent, and then by finding out what happens if only cloth prices rise by 7 percent. This allows us to separate the effect of changes in the overall price level from the effect of changes in relative prices.

An Equal-Proportional Change in Prices Figure 4-6 shows the effect of an equal-proportional increase in P_C and P_F. P_C rises from P_C^1 to P_C^2; P_F rises from P_F^1 to P_F^2. If the prices of both goods increase by 10 percent, the labor demand curves will both shift up by 10 percent as well. As you can see from the diagram, these shifts lead to a 10 percent increase in the wage rate from w^1 (point 1) to w^2 (point 2). However, the allocation of labor between the sectors and the outputs of the two goods does not change.

Figure 4-5

Production in the Specific Factors Model

The economy produces at the point on its production possibility frontier (*PP*) where the slope of that frontier equals minus the relative price of cloth.



produced. While the amounts of each good that a country consumes and produces may differ, however, a country cannot spend more than it earns: The *value* of consumption must be equal to the value of production. That is,

$$P_C \times D_C + P_F \times D_F = P_C \times Q_C + P_F \times Q_F. \quad (4\text{-}7)$$

Equation (4-7) can be rearranged to yield the following:

$$D_F - Q_F = (P_C/P_F) \times (Q_C - D_C). \quad (4\text{-}8)$$

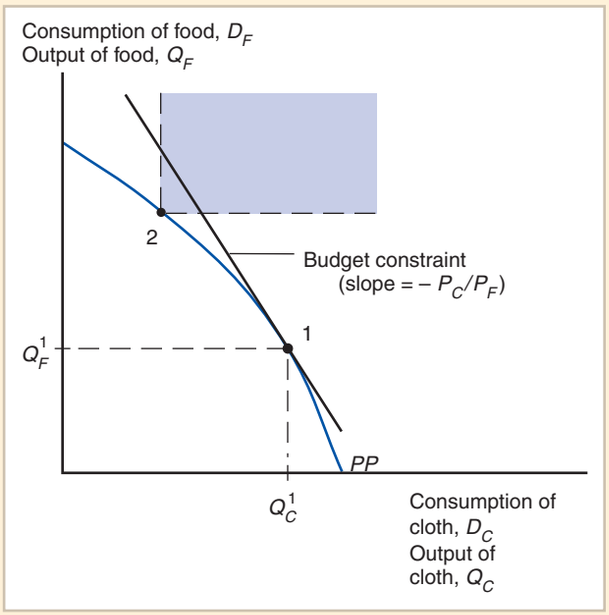
$D_F - Q_F$ is the economy's food *imports*, the amount by which its consumption of food exceeds its production. The right-hand side of the equation is the product of the relative price of cloth and the amount by which production of cloth exceeds consumption, that is, the economy's *exports* of cloth. The equation, then, states that imports of food equal exports of cloth times the relative price of cloth. While it does not tell us how much the economy will import or export, the equation does show that the amount the economy can afford to import is limited, or constrained, by the amount it exports. Equation (4-8) is therefore known as a **budget constraint**.[5]

Figure 4-11 illustrates two important features of the budget constraint for a trading economy. First, the slope of the budget constraint is minus P_C/P_F, the relative price of cloth. The reason is that consuming one less unit of cloth saves the economy P_C; this is enough to purchase P_C/P_F extra units of food. In other words, one unit of cloth can be exchanged on world markets for P_C/P_F units of food. Second, the budget constraint is tangent to the production possibility frontier at the chosen production point (shown as point 1 here and in Figure 4-5). Thus, the economy can always afford to consume what it produces.

Figure 4-11

Budget Constraint for a Trading Economy and Gains from Trade

Point 1 represents the economy's production. The economy can choose its consumption point along its budget constraint (a line that passes through point 1 and has a slope equal to minus the relative price of cloth). Before trade, the economy must consume what it produces, such as point 2 on the production possibility frontier (*PP*). The portion of the budget constraint in the colored region consists of feasible post-trade consumption choices, with consumption of both goods higher than at pretrade point 2.



[5] The constraint that the value of consumption equals that of production (or, equivalently, that imports equal exports in value) may not hold when countries can borrow from other countries or lend to them. For now we assume that these possibilities are not available and that the budget constraint (equation (4-8)) therefore holds. International borrowing and lending are examined in Chapter 6, which shows that an economy's consumption *over time* is still constrained by the necessity of paying its debts to foreign lenders.