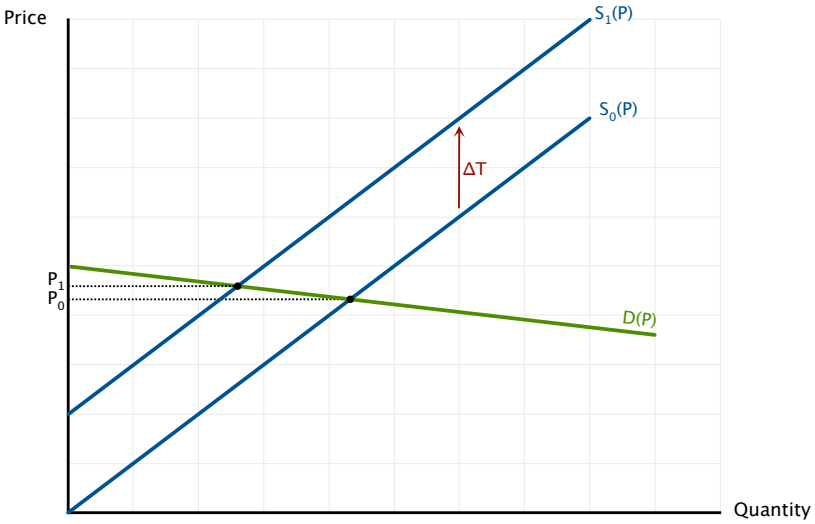
Johan Stennek, 19 October 2014

AMT – Johan's Problem Set 2

Note that question 5 is optional and will not be discussed in class.

1 Markets for substitutes and complements

Some economists propose that the government should increase the tax on books (which is today lower than taxes on most other goods). They present their proposal in a standard partial-equilibrium diagram:



The proposers argue that since the demand for books is relatively elastic, even a large tax increase will not increase the price of books by much. In the figure above ΔP is much smaller than ΔT. Cunningly, they do not explicitly mention that this means that people will read much less. They wish to present their proposal in the most favorable light.

The publishing companies hire a public relations expert to start a campaign against the proposal. They have to accept that the public discussion is all about the price and that any arguments about reading habits are of secondary importance.

At a meeting at the public relations firm, someone suggests that it might be possible prove that the economists have underestimated the price increase. They figure that one needs to take into account the interaction between the book

market and other "neighboring" markets. The question is if they should point at interaction effects with markets for substitute goods (such as movies) or complementary goods (such as book shelves). How would you advice them? Should they focus on substitutes or complements? Also help them with a nice diagram to illustrate the argument.

2 The social resource constraint

Let us start with a numerical example. Assume that it takes 2 hours for tailors to sew a shirt and 6 hours to sew a pair of trousers. What is the cost of a pair of trousers in terms of shirts to society? Assume that all the tailors together work 6000 hours per year. Depict the production possibility frontier in a figure with the number of shirts on the vertical axis and the number of trousers on the horizontal axis.

Now, let us do the same thing more generally. Assume that the production function for shirts has constant returns to scale and is given by $q_s = \frac{1}{\varphi_s} \cdot l_s$ where l_s is the number of tailors sewing shirts, q_s is the number of shirts sewed and φ_s^{-1} is the labor requirement for shirts. Also the production function for trousers has constant returns to scale and is given by $q_t = \frac{1}{\varphi_t} \cdot l_t$ where l_t is the number of tailors sewing trousers, q_t is the number of trousers sewed and φ_t^{-1} is the labor requirement for trousers. There are in total L tailors in the country. Since $l_s + l_t = L$, any extra hour spent on sewing trousers leaves one hour less for sewing shirts. Substituting $q_i \cdot \varphi_i = l_s$ into the resource constraint, it can be written as

$$q_s \cdot \varphi_s + q_t \cdot \varphi_t = L$$

to express the production possibilities. Differentiate this production possibility constraint to compute the cost of a pair of trousers in terms of shirts to society.

That is, compute how many fewer shirts ($\Delta q_s < 0$) that must be produced for every extra pair of trousers ($\Delta q_t > 0$)?

Compare your answer to the more general question with your answer to the numerical example above!

3 General Equilibrium

Mr. Anderson and Mr. Peterson both supply 10 hours of work independent of what the market wage happens to be. Mr. Anderson's is fond of apples. His utility function is given by $U^A = 2 \cdot \ln\left(q^A_{apple}\right) + \ln\left(q^A_{pear}\right)$ where q^A_{pear} denotes how many pears Mr. Anderson eats, and so on. Mr. Peterson's is fond of pears and has utility

function $U^P = \ln\left(q^P_{apple}\right) + 2 \cdot \ln\left(q^P_{pear}\right)$. The production functions are given by $q_{apple} = 2 \cdot L_{apple}$ and $q_{pear} = 4 \cdot L_{pear}$, where L_{apple} is the labor input in pear production. Let p_{apple} and p_{pear} be the fruit prices and w the hourly wage rate.

1. Find the market demand for apples and pears in general equilibrium.
2. Find the relative prices p_{apple}/w and p_{pear}/w in general equilibrium.
3. Find the labor demand in the two production sectors.

4 Efficiency

Mr. Anderson consumes three different kinds of fruit and has utility $U^A = U^A\left(q_{apple}, q_{pear}, q_{banana}\right)$. Denote the marginal utilities by $U^A_{apple}\left(q_{apple}, q_{pear}, q_{banana}\right)$, $U^A_{pear}\left(q_{apple}, q_{pear}, q_{banana}\right)$ and $U^A_{banana}\left(q_{apple}, q_{pear}, q_{banana}\right)$.

1. Compute Mr. Anderson's valuation of apples in terms of pears. (Hint: use the marginal rate of substitution.)
2. Argue that any allocation of apples and pears between Mr. Anderson and Mr. Peterson is Pareto inefficient if the two men have different valuations of apples in terms of pears. (Hint: Show that they could both gain from exchanging fruit with each other?)
3. Argue that any given amount of apples and pears will be distributed efficiently between Mr. Anderson and Mr. Peterson, if they both pay the same prices p_{apple} and p_{pear}. (Hint: First characterize how much each person buys of the two fruits.)

5 International trade (optional)

People in developing countries have been worried that international trade might hurt them. As they have less capital, they are less productive. How would they be able to compete on the world markets?

Imagine that a worker in a the North, thanks to the use of machines, can produce both trousers and shirts at 6 per hour, while a worker in the South can produce either 2 trousers or 4 shirts in an hour.

How would you argue? Would it be better for the South to close their borders?

6 Taxation

After the big Swedish tax reform of the 1990:ies, all goods where taxed by the same VAT rate. The motivation for the uniform tax rate was efficiency. Individual commodities have since then had their VAT-rates lowered for various reasons. One example is a large reduction of the VAT rate on restaurant meals. Also this reduction was made for efficiency reasons.

Explain shortly why a common VAT level might be efficient. Explain why it might be efficient with a lower VAT rate on restaurant meals.