ECON 1101-58 Fall 2004
ADDITIONAL NOTES #5

TAXES ON INPUTS

In the end of the lecture on 28 of October I showed you what happens when the government imposes tax on the competitive firms. This tax increases the costs for each unit produced by the amount of the tax. It happens when the government puts tax *on the inputs* of the firms. For example, this can be the tax on gas: lots of firms are transporting stuff and tax on gas will increase their cost of production. As a result, the long run equilibrium changes, because the increase in costs creates short run losses for the firms, which previously had zero economic profit. This also decreased the total surplus in the economy (see Fig. 1). In this situation there is nothing firms can do about it.

TAXES ON OUTPUT

Most of the taxes you see in the economy are imposed *on the output*. This means that the government asks producers/consumers to pay $\$t$ dollars for each unit of the good sold/purchased. It turns out that for our analysis *it does not matter who pays the tax*: producer or consumer. This happens because, when government imposes the tax, market equilibrium shifts. Unlike in the previous case of taxes on inputs, firms (or consumers) react on tax by producing/purchasing less units of the good.

Notice that the tax on output does not change either the cost structure of the firms (so the supply curve stays where it is) or the demand of the consumers (so the demand curve stays where it is). The change that the tax brings is the following: the price paid by the consumers is now bigger than the price obtained by the producers. The difference is the amount of the tax, which goes to the government. Therefore, new equilibrium on the market is described by Fig. 2: Q^*, P^* - old equilibrium; t – size of the tax; Q_t – number of units of the good sold/purchased; P_D – price paid by the consumers; P_S – price received by the producers. Here new equilibrium with tax consists of three numbers: Q_t – number of units of the good sold/purchased; P_D – price paid by the consumers; P_S – price received by the producers.

You can see that whoever (firms or consumers) is actually paying the tax does not matter: in the new equilibrium the tax burden is divided somehow between the firms and the consumers (depending on the shapes of supply and demand). We want to ask the following question: who is paying more of the tax? In order to answer this we introduce new concept:

DEF **Tax Burden**. We call $P_D - P^*$ the tax burden of the consumers and $P^* - P_S$ the tax burden of the producers (see Fig.2).

Tax burden is just the difference between prices that where paid by producers/consumers before and after the tax.

Now we can ask: Who carries bigger tax burden: producers or consumers? The answer depends on the elasticities of supply and demand. On the figures 3 and 4 you can see two

different markets with tax. Notice that tax burden on consumers is big when demand is inelastic (Fig 3.) and tax burden on producers is big when supply is inelastic (Fig. 4).

SUBSIDIES

Subsidy is a negative tax. For each unit bought/sold on the market the government pays $s dollars to the consumer/producer. Again, new equilibrium on the market will have the price received by producers and the price paid by consumers different by the size of the subsidy. Only in this case the difference will have the opposite sign: consumers will pay less and firms will get more (see Fig 5.). New equilibrium consists of three numbers: Q_s – new quantity traded; P_S – price received by the firms; P_D – price paid by consumers.

Analogous definition:

DEF **Subsidy Benefit**. The subsidy benefit of the consumers is $P^* - P_D$, the subsidy benefit of the producers is $P_S - P^*$.

As you probably can guess, who gets the biggest benefit depends on the elasticities of supply and demand (see Fig 6,7).

Notice that subsidy benefit of consumers is big when demand is inelastic (Fig 6) and subsidy benefit of producers is big when supply is inelastic (Fig. 7). Thus we can conclude: *when demand/supply is inelastic both taxes and subsidies will have big impact on demand/supply: taxes will create big burden (bad!), subsidies will create big benefit (good!).*

TAXES AND EFFICIENCY

In order to think about efficiency we need to include new agent in our surplus calculations, namely the government. We assume that government does not waste the money it gets from taxes and that all those money are later received by somebody and therefore included in the total surplus. So now we have generalized formula:

Total Surplus = Producer Surplus + Consumer Surplus + Government Revenue

We can construct the small table of surpluses before and after the tax (see Fig 8):

	Producer S	Consumer S	Govt	Total S
before tax	CDF	ABE	0	ABCDEF
after tax	D	A	BC	ABCD

Notice that the government gets the area BC after the tax, which equals to t^*Q_t – amount of units traded multiplied by the size of the tax. Comparing Total Surplus before and after the tax we see that the area EF is now lost (nobody gets those money anymore). EF is called the *Dead Weight Loss*.

SUBSIDIES AND EFFICIENCY

We do exactly the same thing with subsidies. The table looks like this (see Fig 9):

	Producer S	Consumer S	Govt	Total S
before sub.	CD	AB	0	ABCD
after sub.	CDBE	ABCF	-(BCEFG)	CDBE + ABCF - BCEFG = ABCD - G

Government spends for this subsidy $s*Q_s$ which is an area BCEFG, thus we subtract this area from the Total Surplus. Notice that Total Surplus after the subsidy is smaller than before by area G. We call G the *Dead Weight Loss*.