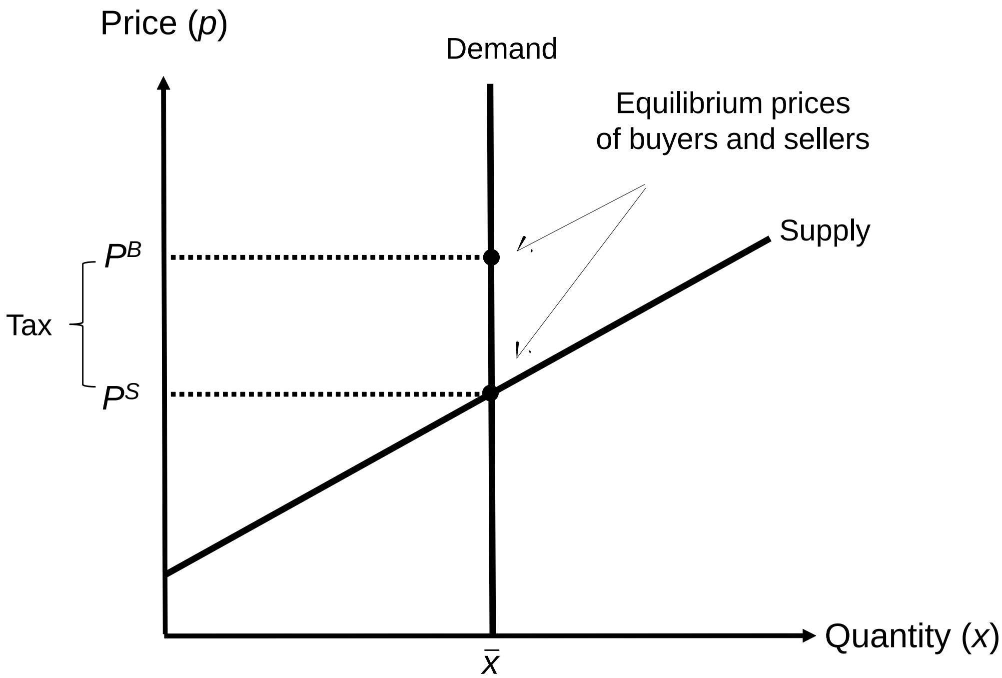
Answers
Re-exam in Public Finance - Summer 2016
3-hour closed book exam

Part 1

(**1A**) No. Inequality measures the variation across individuals in economics outcomes, for example variation in income or wealth at a given point in time or differences in lifetime income across individuals. Intergenerational mobility measures how economic outcomes are related across generations. A high degree of intergenerational persistence (low degree of mobility) implies that a high degree of inequality is transmitted to the next generation. To see the difference between the two concepts, consider as an example two countries that have the same variation in income over time. One country has no intergenerational mobility, implying that a child get the same position in the distribution as the parents, while the other country has perfect intergenerational mobility, implying that the position of a child in the distribution is completely random. Thus, the two countries have the same distribution, but very different intergenerational mobility, with parents being crucial for outcomes of children in one country, but not in the other country.

(**1B**) No. The economic incidence of a tax measures how the economic burden of the tax is shared among buyers and sellers in the market. This is different from the formal/statutory/legal tax incidence stating who has the legal obligation to pay the tax.

Figure 1 illustrates the incidence of a tax in a supply-demand diagram when demand is fixed, i.e. the demand curve is vertical at $\bar{x}$. This implies that buyers are willing to buy $\bar{x}$ at any (positive) price. Sellers will supply exactly $\bar{x}$ if the price they receive after taxes is p^S in the diagram, which therefore becomes the equilibrium after-tax price. At this price the buyers pay $p^B = p^S + t$, where t is the tax. Without the tax, the sellers will also supply $\bar{x}$ at the price equilibrium price p^S, and this would then also be the price of the buyers. This implies that in the case of the tax the buyers bear the full burden of the tax as described in the statement.



It may be noted that the incidence of a tax may be written approximately as

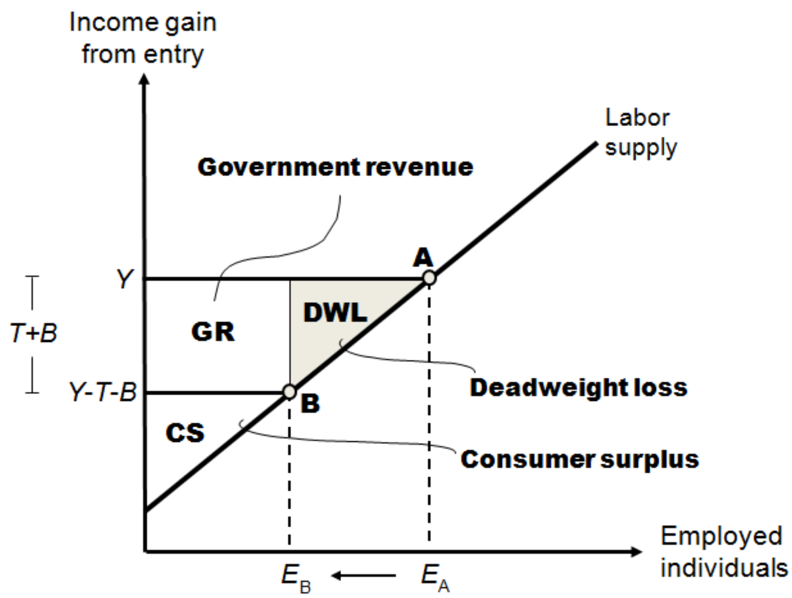
$$I_S \approx \frac{\varepsilon_B}{\varepsilon_S + \varepsilon_B},\ I_B \approx \frac{\varepsilon_S}{\varepsilon_S + \varepsilon_B},$$

where I_S and I_B are the incidence of the seller and the buyer, respectively, and where ε_B is the price-elasticity of the demand of the buyers, while ε_S is the price-elasticity of the supply of the sellers. A fixed supply corresponds to $\varepsilon_B = 0$, implying that $I_S = 0$ and $I_B = 1$, also showing that the full incidence is on the sellers.

(**1C**) No. Extensive margin responses are movements in and out of the labor market. These responses are typically discrete changes, i.e. you either work for example 20-40 hours a week if working and zero hours if not working. Taxes may create distortions along the extensive margin as illustrated in the figure below from the curriculum (it would be good with more details about the underlying theory/model) where Y denotes income before taxes from working, T denotes tax payment when working, and B denotes the after-tax benefit level if not working. The labor supply curve represents differences in willingness to work across individuals. If the net gain from working, $Y - T - B$, is high then many individuals will wish to work and vice versa. Without any tax-benefit system the income gain from working equals Y and giving the employment E_A in the diagram, while with the tax-benefit system employment becomes E_B. This gives rise to the deadweight loss (=efficiency loss) illustrated in the figure. The loss in aggregate surplus arises because firms are willing to pay Y, which is higher than the reservation wage of all the individuals in the range from E_B to E_A. The tax-benefit system creates a tax wedge equals to

$T + B$, which gives rise to the efficiency loss. In addition, it may be mentioned that the size of the deadweight loss depends on the size of the participation elasticity, reflecting how sensitive labor supply responds to economic incentives along the extensive margin.

Welfare cost of taxation with extensive labor supply responses



<u>Part 2</u>

(**2A**) The first term in equation (1) is the net-income if caught evading multiplied by the probability of being caught, while the second term is the income if not caught evading multiplied by the probability of not being caught. Thus, the first two terms equal the expected income. Note that an implicit assumption behind the utility function is that the agent is risk neutral corresponding to utility being linear in income.

Whether the taxpayer is caught or not, he gets a loss of utility from evading due to moral, shame etc. reflected in the last term in the equation where the parameter χ captures the strength of these moral concerns of the tax payer. Note that the noral concern is related to the size of income evaded and not to the size of tax unpaid due to evasion.

Equation (2) defines the net-income if not caught evading. It is equal to the income after tax when reporting truthfully (the first term) and the taxes saved by evading the amount E (the second term).

Equation (3) defines the net-income if caught evading. It is equal to the income after tax when reporting truthfully (the first term) and the fine the taxpayer has to pay from the detected evasion, which equals the share F of the *evaded income*. This is different from the models presented in the lectures where it has been assumed that the fine is proportional to the evaded tax (i.e., proportional to the tax consequence of the evaded tax).

(2B) The optimal behavior of a taxpayer is found by inserting eqs (2) and (3) in eq. (1) and differentiating with respect to E. After inserting eqs (2) and (3) in eq. (1), we have

$$U^e = (1-q)\left[(1-t)Y + tE\right] + q\left[(1-t)Y - FE\right] - \chi E.$$

Differentiation with respect to E gives

$$\frac{dU^e}{dE} = (1-q)\,t - qF - \chi. \tag{1}$$

If this is positive then the taxpayer will evade taxes (because of the linear structure the taxpayer will evade on all income), and if it is negative then the taxpayer will not evade. The first term in the expression is the marginal benefit of evading one additional euro equal to the increase in net-income (due to saved taxes) if not caught, while the second and third terms reflect marginal costs. The second term is the extra fine paid if caught and the third term represents the increase in moral costs from the additional underreporting of income.

A higher probability q of being caught will reduce the expected income gain and increase the expected fine. Thus, the incentive to cheat is reduced. A higher fine parameter F will increase the marginal cost of being caught and thereby reduce the incentive. A higher tax rate t increases the incentive to cheat because the saved taxes per euro of underreporting goes up without having any consequences for the marginal costs. This is different from the models presented in the lectures where both fine and moral costs are related to the amount of taxes cheated (instead of just income), implying that it depends on t. When this is the case, marginal benefits and marginal costs are both proportional to the tax rate, implying that the decision on whether to cheat or not is unrelated to the tax rate t.

(2C) Yes, it is possible with this model to have that nobody evades taxes if the probability of detection is small and the fine is small. It requires that net-utility gain of cheating is negative for all individuals, which from the above equation is the case if $\chi > (1-q)\,t + qF$. Thus, it requires a sufficiently high tax morale of all individuals. In the limit where q equals zero, we have $\chi > t$, where t is the share of income you could save in taxes by cheating, while χ is the moral costs in proportion to income cheated.

<u>Part 3</u>

(**3A**) The unemployment insurance system may benefit the workers if they are risk averse, corresponding to a decreasing marginal utility of income. Moral hazard problems may arise because of a 'hidden action', in this case if the social planner cannot observe the search effort level e. The UI benefit system decreases the privat incentive to search for job because it reduces the consequence of being unemployed, which create a fiscal externality on other workers because taxes then have to be increased on employed workers in order to obtain sufficient finances for the benefit system.

(**3B**) Equation (1) denotes the expected utility of a worker depending on the chosen search effort level e. The first term is the utility when employed, giving income/consumption equal to after-tax labor income $(1-t)\,y$, multiplied by the probability of employment, which in this formulation is assumed identical to the search effort level e. The second term is the utility when unemployed, giving income/consumption level equal to the unemployment benefit level b, multiplied by the probability of unemployment. The last term in the equation is the disutility from the effort.

Equation (2) is the budget constraint of the social planner saying that tax revenue paid by employed workers (the right hand side) has to be larger than or equal to the aggregate UI benefits paid to unemployed workers (the left hand side).

(**3C**) The social planner maximizes (1) wrt. t, b and e subject to (2). The Lagrangian equals

$$L = eu\left(\left(1-t\right)y\right) + \left(1-e\right)u\left(b\right) - v\left(e\right) + \lambda\left[ety - \left(1-e\right)b\right],$$

and the first order conditions become

$$\begin{aligned}
\frac{dL}{dt} &= -eyu'\left(\left(1-t\right)y\right) + \lambda ey = 0 \\
\frac{dL}{db} &= \left(1-e\right)u'\left(b\right) - \lambda\left(1-e\right) = 0 \\
\frac{dL}{de} &= u\left(\left(1-t\right)y\right) - u\left(b\right) - v'\left(e\right) + \lambda\left(ty+b\right) = 0
\end{aligned}$$

From the first two equations, we get $\lambda = u'\left(\left(1-t\right)y\right) = u'\left(b\right)$, which is only possible if

$$\left(1-t\right)y = b,$$

which is equation (3) in the assigment.

It shows that the social planner will raise taxes and UI benefits until the level where consumption is the same across the two states (employment, unemployment). This gives perfect insurance and thereby maximize the expected utility of the risk averse agent, which may be acomplished without negative moral hazard effects because the social planner can observe the search effort level of the individuals.

(**3D**) Equation (4) characterizes the second-best optimal UI benefit level when the social planner cannot observe effort. The LHS represents the marginal benefits from consumption smoothing, measured by relative differences in marginal utilities in good and bad states, while the RHS is the marginal costs from moral hazard. The elasticity ε captures the effect of the UI benefit level on the duration of unemployment, and thereby the strength of the moral hazard effect. If ε is large then the moral hazard costs are large on the right hand side, which ceteris parbus implies that the difference in marginal utility of consumption across the two states on the LHS has to be larger, which corresponds to less insurance in the social optimum.

If ε equals zero then it implies that unemployment is independent of the benefit level. In this case, there is no problem of moral hazard, and the social planner will then chose full insurance, $(1-t)\,y = b$, as above, even though the effort level e is unobservable.

(**3E**) Card et al. (2007) use a regression discontinuity method to estimate the effect of unemployment insurance on the duration of unemployment. They exploit that the length of the UI benefit period in Austria depends on the employment history of the individual with a jump in the length of the period (from 20 weeks to 30 weeks) when a person has been employed for more than a certain threshold number of months (36 months during the past 5 years). By comparing individuals with past employment just below and just above the threshold, assuming that this difference is due to randomness, it is possible to obtain a casual estimate of the effect of extending the UI benefit period. The graph shows one of their main results, namely that individuals just above the threshold are without a job 7 days longer than those just below the threshold.

It may be noted that a threat to identification is that the variation around the threshold is not fully random. For example, in the analysis of Card et al. firms may fire the least productive workers just before the 36 month threshold in order to avoid paying severance payment. However, the evidence in Card et al. does not indicate that this is a problem.