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Public Economics

Fall 2023

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You have a total of 120 minutes (2 hours) to solve the exam.
Read each question carefully. If you need additional space to write, please use the back of the same page. Good luck!

I (5 points)

Discuss the following propositions (max. 10 lines for each).

(a) (1.25 points) A policymaker who wants to maximize a Rawlsian social welfare function will defend poverty-alleviation programs.

According to the Rawlsian social welfare function, welfare of a society is defined by the utility of the person who is worse off. Poverty-alleviation programs are meant to ensure that people are above the poverty line and are typically directed towards those who are worse off (in terms of income, which highly correlates with utility). Therefore, we can argue that this statement is true: poverty-alleviation programs will in fact promote welfare according to the Rawlsian view.

Grading: 0.5 for the Rawlsian social welfare function, 0.25 for poverty-alleviation programs, 0.5 for the conclusion.

(b) (1.25 points) A referendum on whether a new military facility should be built will lead to a Pareto improvement.

Defense is a public good and, since individual preferences will be single-peaked, the median voter theorem allows us to achieve a consistent aggregation of individual preferences into a social preference. However, the median voter choice achieved in a referendum is not necessarily efficient, because it does not take into consideration intensity of preference. Moreover, even if the distribution of costs and benefits is such that the median voter choice approaches efficiency, moving from an inefficient choice to an efficient one does not imply a Pareto improvement. Only unanimity (and not a majority) would ensure a Pareto improvement.

Grading: 0.25 for the identification of the good and single-peaked preferences, 0.25 for the median voter theorem, 0.25 for the consideration on the median voter choice and efficiency, 0.5 for the conclusion about Pareto improvement.

(c) (1.25 points) The walrasian solution from equal division reconciles efficiency and no-envy, but it may fail to satisfy the equal-division lower bound.

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False. A walrasian equilibrium from equal division is indeed efficient (1st Welfare Theorem) and envy-free (since all agents maximize utility subject to the same budget constraint that includes equal division), but it must also satisfy the equal-division lower bound: since equal division is affordable for all agents, their consumption choice must be at least as good as equal division.

Grading: 0.5 for efficiency and no-envy (including notion), 0.5 for equal division lower bound and argument, 0.25 for the conclusion.

(d) (1.25 points) Since they have a higher life expectancy, women should make larger contributions towards Social Security.

A higher life expectancy (that is generally a consequence of behavioral choices that should be encouraged) may imply a higher social security wealth, but it is also true that, in general, women have a more elastic labor supply and end up contributing less throughout their careers and thus receiving lower benefits. This is also a consequence of the structural inequality based on gender – and fairness would require policies to correct that inequality (and not to aggravate it). Moreover, the statement on life expectancy is a generalization based on a demographic characteristic that includes a large diversity of individuals (and life expectancy varies substantially among women, and also among men). Fairness concerns would therefore work against this possibility in different ways.

Grading: 0.25 for social security wealth argument, 0.5 for structural analysis, 0.5 for the point on generalizations.

II (4.5 points)

Consider an economy with three agents and a mixed good: secondary education.

The aggregate demand curve for the private component is p = 9 – 3q.
Let the *individual* marginal valuations for the public component of the mixed good be $p_1 = 3 - q$ for agent 1, $p_2 = 3 - q$ and $p_3 = 6 - 2q$ for agent 3.
The marginal cost is 7.

a. (2 points) What is the difference between the socially optimal quantity and the amount that will be provided by the market?

We already have the aggregate demand for the private component: $P^{Priv} = 9 - 3q$.
The public benefits must be summed vertically:
$P^{Pub} = 3 - q + 3 - q + 6 - 2q = 12 - 4q$
Market Outcome: $P^{Priv} = MC \Leftrightarrow 9 - 3q = 7 \Leftrightarrow q^{Market} = 2/3$
Socially Optimal: $P^{Priv} + P^{Pub} = MC \Leftrightarrow 21 - 7q = 7 \Leftrightarrow q^{Optimal} = 2$

Grading: 0.5 for finding the public component with the correct domain, 0.75 for the market outcome, 0.75 for the social optimum.

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b. (0.5 points) What is the feature of this good that prevents efficiency from being achieved in the market (without government intervention)?

The positive externality (and non-excludability)

c. (1 point) Suggest one subsidy policy to achieve the efficient solution.

Students may suggest either Pigouvian Subsidies or Lindahl Subsidies.

A Pigouvian subsidy would be a subsidy to producers such that $P^{Priv}(q^{Opt}) = MC - S \Leftrightarrow 9 - 3 * 2 = 7 - S \Leftrightarrow S = 4$

A Lindahl subsidy would be a subsidy to consumers, amounting in total to $S = P^{Pub}(q^{Opt}) = 12 - 4 * 2 = 4$, which would then be distributed among agents according to: $S_i = p_i(q^{Opt})$. This would be 1 to agent 1 and 2, and 2 to agent 3.

Grading: 0.25 for mentioning the subsidy, 0.25 for explaining how it is attributed, 0.5 for computing.

d. (1 point) Are there any other reasons for Government intervention in this market? Based on all the reasons, would you still recommend the policy in c.? (max. 8 lines)

Other reasons include regarding failure to maximize family utility, liquidity constraints (and credit market failure), and fairness (equality of opportunity, income mobility). Regarding the policy suggestion, there could be arguments for public provision or public financing beyond the subsidy.

Grading: 0.5 for the discussion of other reasons, 0.5 for the discussion on the policy suggestion.

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III (3.75 points)

In Splitsville, there are two types of agents, according to the risk of becoming ill with a new virus – the Resistant (R) and the Vulnerable (V). There are 50% of people of each type.
All agents have an income of 25 to spend in consumption. However, if they become sick, they have to spend 16 in medical expenditures. Vulnerable agents have utility function $u = \sqrt{x}$, where x is their income. However, while the Resistant group only has a 10% probability of getting sick, the Vulnerable have a 50% probability.

a. (1.25 points) Find the actuarially fair price and the maximum willingness to pay for full insurance for the Vulnerable agents.

$AFP_V = E(loss) = 50\% * 16 = 8$
$E\big(U(x)\big) = U(CE) \Leftrightarrow 50\% * \sqrt{25} + 50\% * \sqrt{25 - 16} = \sqrt{CE} \Leftrightarrow CE = 16$
$RP = E(x) - CE = 50\% * 25 + 50\% * 9 - 16 = 1$
$WTP = AFP + RP = 8 + 1 = 9$

Grading: 0.25 for AFP, 0.5 for CE, 0.25 for RP, 0.25 for WTP.

b. (1 point) Assume that the willingness to pay for full insurance of a Resistant agent is 2. If the insurance company cannot distinguish among agent's types, explain what you expect to happen in this market.

If the insurance company cannot distinguish among agent's types, it will initially charge a pooled AFP. $AFP_{Pooled} = 50\% * AFP_V + 50\% * AFP_R = 50\% * 8 + 50\% * (10\% * 16) = 4.8.$

At such price, since $WTP_R < AFP_{Pooled}$, the Resistant group will not want to buy insurance. The insurance firm will start making a loss and increase its AFP until AFP_V.

Since the Resistant agents leave the market, only the Vulnerable will remain. This is a situation of Adverse Selection.

Grading: 0.5 for pooled AFP, 0.25 for finding that the Resistant leave the market, 0.25 for concluding this is Adverse Selection.

c. (1.5 points) Comment on the following statement: "For efficiency and fairness, the government should provide partial health insurance for all." (max 10 lines)

As seen in b), asymmetry of information leads to a situation where the R type would leave the market and would prefer facing the risk instead of getting full insurance. This is a typical case of Adverse Selection. As such, solely for efficiency purposes, there is room for government intervention, as insurance allows agents to increase utility by being able to smooth consumption and transfer risk to the insurance firms. Moreover,

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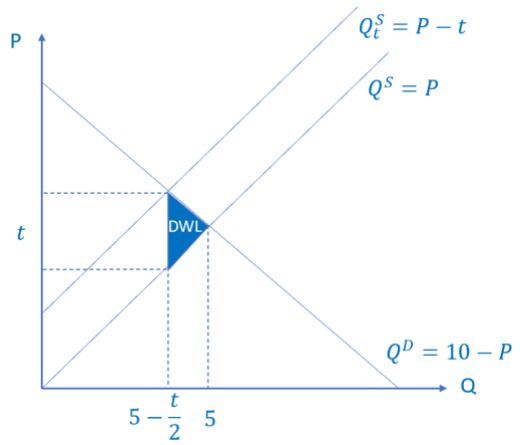
on fairness grounds, further arguments can be done, such as the government intervening for paternalistic concerns or to do redistribution (from the Resistant to the Vulnerable group). To minimize Moral Hazard issues, the government can introduce deductibles for small expenses to try to balance the consumption smoothing benefits and the moral hazard costs. Full coverage in health insurance is usually not optimal if one were to only care about efficiency.

Grading: 0.5 for efficiency arguments for provision for all (adverse selection), 0.5 for efficiency arguments for partial coverage (moral hazard), 0.5 for further fairness arguments.

IV (4.25 points)

In the market for apples, these are the demand and supply functions: $Q^D = 10 - P$ and $Q^S = P$. The government is considering implementing a tax t to be paid by producers, for each unit of apples sold.

a. (1 point) Identify in a graph the deadweight loss of imposing a tax of t in this market.



Grading: 0.5 for the curves, 0.5 for the correct triangle.

b. (1.25 points) Show that the Deadweight Loss of imposing a tax of t in this market is given by $DWL = \frac{t^2}{4}$ and that the total revenue of the government is given by $R = 5t - \frac{t^2}{2}$.

As we can see in the plot above, $Q^D = Q^S \Rightarrow Q = 5$ and, since $Q_t^S = P - t$, $Q^D = Q_t^S \Rightarrow Q_t = 5 - \frac{t}{2}$.

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$$DWL = \frac{t * \Delta Q}{2} = \frac{t * \left(5 - \left(5 - \frac{t}{2}\right)\right)}{2} = \frac{t^2}{4}$$
$$R = t * Q_t = t * \left(5 - \frac{t}{2}\right) = 5t - \frac{t^2}{2}$$

Grading: 0.25 for finding Q and Q_t, 0.5 for computing DWL, 0.5 for computing R.

c. (1.25 points) The government may also choose to tax the market of jewellery, which has the following functions: $DWL_J = \frac{t_J^2}{20}$ and $R_J = t_J - \frac{t_J^2}{10}$. If the government only cares about efficiency, which taxes, t_A (on the market of apples) and t_J (on the market of jewellery), will it impose if it wants to collect a total revenue of 15?

If efficiency is the government's only concern, then it solves:
$$\min \sum DWL = DWL_A + DWL_J \quad st. R_A + R_J = 15$$

To solve this problem, we use the Ramsey Rule:
$$\frac{MDWL_A}{MR_A} = \frac{MDWL_J}{MR_J} \Leftrightarrow \frac{\frac{2t_A}{4}}{5 - \frac{2t_A}{2}} = \frac{\frac{2t_J}{20}}{1 - \frac{2t_J}{10}} \Leftrightarrow t_A = t_J$$

Plugging into the constraint, we find the exact values of the taxes:
$$R_A + R_J = 15 \Leftrightarrow 5t_A - \frac{t_A^2}{2} + t_A - \frac{t_A^2}{10} = 15 \Leftrightarrow t_A = t_J = 5$$

Grading: 0.25 for setting the problem, 0.25 for the Ramsey Rule, 0.5 for solving to find $t_A = t_J$, 0.25 for concluding $t_A = t_J = 5$.

d. (0.75 points) If the government has fairness concerns as well, explain how your answer might change (with no additional calculations, max. 8 lines).

On fairness grounds, we may argue that jewellery are a luxury good, while apples are more of a necessity good. Lower income individuals likely spend a higher share of their income on apples than higher income individuals. Consequently, vertical equity (higher income individuals should pay proportionally higher taxes) will recommend increasing the tax rate on jewellery while decreasing it on apples.

Grading: 0.5 for a well-structured fairness argument relating the nature of the goods to a concept of fairness (such as vertical equity), 0.25 for a recommendation on how the taxes should change.

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V (2.5 points)

Taking into account efficiency and equity concerns, explain your policy recommendations for disability insurance and worker compensation, pointing out the main differences and similarities between them.
(Max 20 lines)

Disability Insurance (DI) consists in benefits to those who suffer a disability that prevents them from working. Workers' Compensation (WC) consist in benefits for those who sustain an injury while performing their job.
For efficiency purposes, the trade-off between Consumption Smoothing and Moral Hazard should be assessed. DI covers a more unpredictable event with higher magnitude than WC. Because of that, DI carries higher CS benefits than WC. Moreover, there is an additional problem of monitoring in WC, since it is difficult to assess whether the injury was actually sustained on the job. As such, WC carries a higher MH problem than DI. As such, for efficiency purposes, a higher replacement rate and a higher duration should exist for DI, in comparison with WC.
For equity and fairness concerns, several arguments can be made. Namely, it can be argued that lower income families should be more insured against these risks, as they have a lower ability to self-insure, which would result in a recommendation of higher replacement rates and a higher duration of benefits for poorer households. Moreover, it can also be suggested that the benefits last for the entire duration of the incapacitating nature of the disability.

Grading: 0.5 for properly defining DI and WC, 1 for efficiency arguments, 0.5 for fairness arguments, 0.5 for the policy suggestions on replacement rates and duration.