Public Economics

Fall 2022

Paulo P. Côrte-Real

Henrique Silva Santos

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) Fairness concerns justify both poverty-alleviation programs and progressive income taxation.

With respect to poverty-alleviation programs, there is an attempt to define poverty in absolute terms (based on the notion of poverty line); they can be justified based on social welfare functions (such as the Rawlsian or the utilitarian social welfare function) that combine fairness and efficiency; progressive income taxation (where the average tax rate increases with income) is based on a concern with relative income inequality and is a consequence of vertical equity (and can also be justified with social welfare functions, again combining fairness and efficiency).

Grading: 20% for the definition of progressive income taxes, 20% for the notion of poverty-alleviation programs, 20% for the relative/absolute distinction, 40% for the discussion of fairness concepts (and social welfare functions).

(b) (1.25 points) Politicians who want to maximize the possibility of getting elected will include in their platform the level of defense spending that the median voter desires.

Defense is a public good and preferences will be single-peaked. If this were the only issue and there were only two candidates, then they would tend to represent the median voter. However, the result would no longer hold if there are more than two candidates or more than one issue at stake (which is generally the case), if money is a factor in election campaigns, if abstention is possible, if information and knowledge about the issues is asymmetric (among others).

Grading: 20% for the identifying the nature of the good and preference shape; 30% for the theorem result, 50% for the discussion of assumptions.

(c) (1.25 points) In an economy with two units of cake (the only good) and two agents with monotonic preferences, the Rawlsian choice will satisfy the equal-division lower bound.

False. If two agents are splitting a cake and agent 1 has utility x_1 and agent 2 has utility $2x_2$, the Rawlsian choice would be to give 4/3 to agent 1 and 2/3 to agent 2 – and this

violates the equal-division lower bound (since agent 2 would strictly prefer equal division).

Grading: 25% for identifying the proposition is false; 25% for the notion of equaldivision lower bound; 50% for the counterexample

(d) (1.25 points) Increasing the (minimum) retirement age is the best way to ensure sustainability of social security.

Legacy debt together with increasing life expectancy pose a challenge to the sustainability of social security. Increasing the legal retirement age has costs (in terms of productivity, labor disutility and labor market). Several possible measures can be considered (and compared).

Grading: 20% for identification of challenges, 20% for costs of increasing retirement age, 60% for comparison of measures

II (5.5 points)

Country A has three equal-sized groups of people: young adults (Y), middle-aged adults (M) and the elderly (E). If a person is healthy, that person will consume the entire income of 100. Becoming sick, however, means a loss of 100 in medical expenses. Each person becomes sick with different probabilities, depending on the group: probability 10% in group Y, 20% in group M and 60% in group E.

We are given the following information for each person's willingness to pay for full insurance, and risk premium:

	Y	М	E
WTP	14	33	84
Risk Premium	4	13	24

a. (2 points) Knowing that each person in group E has a utility function of $U=\sqrt{C}$, where C is the amount of consumption, fill in the missing elements of the table.

Since WTP=AFP+RP, RP for Y is 4 and WTP for M is 33.

For someone in group E, the Certainty Equivalent (CE) is such that U(CE)=0.6*U(0)+0.4*U(100) i.e. $\sqrt{CE}=4$ and CE=16. That means that the WTP is 100-16=84 and therefore RP is 24.

Grading: 15% for each value, 30% for the explanation with the CE, 10% for the explanation with WTP and RP.

b. (1.25 points) If the firm cannot observe which group agents belong to, what do you expect to happen in this market (assume that the insurance market is perfectly competitive)? Present every step of your reasoning.

The firm must charge an average AFP=10/3+20/3+60/3=30

Since 30>WTP for group Y, this group will leave the market. The remaining groups in the market are M and E and therefore there is a new average AFP=20/2+60/2=40. Since 40>WTP for group M, this group will also leave the market, leaving only group E in the market with an AFP of 60. There will be adverse selection and inefficiency.

Grading: 40% *for the first step,* 40% *for the second step and* 20% *for the conclusion.*

c. (1 point) Age is typically observable. If there is a law forbidding different insurance premiums based on age, do you think the law should remain in place? Why or why not? (max. 8 lines)

The law seems to be a problem for efficiency, due to adverse selection; it does seem to promote fairness goals (age is merely a proxy for health risk, with variations with respect to health risk across similar ages) and we can therefore face a tradeoff between the two goals. However, adverse selection also prevents some fairness goals from being achieved, since there will be almost no redistribution from low risk to high risk. A better option to reconcile the two goals might be to create a social insurance program; or to create an insurance mandate that may possibly be combined with subsidies.

Grading: 40% for the efficiency analysis, 40% for the fairness analysis, 20% for a conclusion.

d. (1.25 points) Comment on the following statement: "Since there is adverse selection in this market, the government should provide partial health insurance for all." (max 10 lines)

There are several arguments, based on efficiency and equity, for why governments should provide insurance policies to everyone. These may include: externalities from having a population in which everyone is insured; desirability of having a redistribution from low-risk (healthy) to high-risk (sick) individuals; risk-pooling and the prevention of market failures from adverse selection (as seen in part b)); among others. However, an optimal health insurance policy should balance the consumption- smoothing benefits it brings with its unintended costs (Moral Hazard). Full-Insurance may bring about moral-hazard in which individuals (consumers and providers of treatment) take adverse actions in response to insurance (e.g. *risky behaviour, over-treatment, over-charging*). Partial-insurance might mitigate these issues and may be optimal for smaller expenses, for which the consumption benefits are smaller and it is easier for agents to self-insure against.

Grading: arguments for why governments should provide health insurance to everyone (60%); discuss why full insurance should be avoided (40%)

III (4 points)

Consider an economy with three agents and a mixed good: higher education. The *individual* demand curve for the private component for *each* agent is $p = 10 - q_i$ (i=1,2,3).

Let the *individual* marginal valuations for the public component of the mixed good be $p_1 = 3 - q/6$ for agent 1, $p_2 = 3 - q/6$ and $p_3 = 4 - q/3$ for agent 3. The marginal cost is 10.

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

The private benefits must be summed horizontally since we aggregate quantities: $Q^{Priv} = 3 * q_i = 3 * (10 - p) = 30 - 3p \Leftrightarrow P^{Priv} = 10 - \frac{q}{3}.$

The public benefits must be summed vertically as we aggregate agents' valuations. Note that p_1 and p_2 may be aggregated for $q \le 18$, but p_3 only for $q \le 12$:

$$P^{Pub} = \begin{cases} p_1 + p_2 + p_3, & 0 \le q \le 12\\ p_1 + p_2, & 12 < q \le 18 \end{cases} = \begin{cases} 10 - \frac{2q}{3}, & 0 \le q \le 12\\ 6 - \frac{q}{3}, & 12 < q \le 18 \end{cases}$$

Market Outcome: $P^{Priv} = MC \Leftrightarrow q^{Market} = 0$ Socially Optimal: $P^{Priv} + P^{Pub} = MC \Leftrightarrow 20 - q = 10 \Leftrightarrow q^{Optimal} = 10$ (solution in 1st branch).

$$DWL = \frac{(20 - 10) * (10 - 0)}{2} = 50$$

Grading: 0.25 *for finding the private component,* 0.25 *for finding the public component with the correct domain,* 0.5 *for the market outcome,* 0.5 *for the social optimum,* 0.5 *for the deadweight loss.*

b. (1 point) Suggest a 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 $P^{Priv}(q^{Opt}) = MC - S \Leftrightarrow 10 - \frac{10}{3} = 10 - S \Leftrightarrow S = \frac{10}{3}$

A Lindahl subsidy would be a subsidy to consumers, amounting in total to $S = P^{Pub}(q^{Opt}) = 10 - \frac{2*10}{3} = \frac{10}{3}$, which would then be distributed among agents according to: $S_i = p_i(q^{Opt})$. This would be $\frac{4}{3}$ to agent 1 and 2, and $\frac{2}{3}$ to agent 3.

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

> c. (1 point) What differences would you expect to see in the demand curves if the good were primary education? Would that affect your policy suggestion? (max. 8 lines)

It can be argued that the returns to primary education are more public than private, in comparison with higher education. This relates to the discussion on the Human Capital Theory (education generates positive externalities – more emphasis on the public component) versus the Screening Theory (education is only a way for employers to separate high from low ability candidates – more emphasis on the private component). As such, the public component of demand would likely be higher with primary education. Regarding the policy suggestion, there are further problems involved when we consider primary education, namely regarding failure to maximize family utility – parents may not choose an appropriate level of education for their children. It can thus be better to publicly provide education in that case, instead of providing the subsidy.

Grading: 0.5 for the discussion on the size of the different components of demand, 0.5 for the discussion on the policy suggestion.

IV (3 points)

Assume that there are only two people in this economy and let t_1 and t_2 represent the tax rate charged on each person's income. Tax revenue is a function of the tax rate, according to the Laffer curves: R_1 = t_1 - t_1^2 and R_2 = $3t_2$ - $3t_2^2$. The government needs to collect 1 monetary unit. The deadweight loss associated with taxing each person's labor income is DWL₁= t_1^2 and DWL₂= $3t_2^2$

a) (1.75 points) If the concern of the government is only efficiency, what tax rates should the government impose?

If the government only care about efficiency, then is solves: $\begin{array}{l} \min_{t_1,t_2} DWL_1 + DWL_2 & st. R_1 + R_2 = 1 \\
\text{To solve this problem, we use the Ramsey Rule:} \\
\frac{MDWL_1}{MR_1} = \frac{MDWL_2}{MR_2} \Leftrightarrow \frac{2t_1}{1 - 2t_1} = \frac{6t_2}{3 - 6t_2} \Leftrightarrow t_1 = t_2 \\
\text{Now replace in the constraint:} \\
\end{array}$

$$t_1 - t_1^2 + 3t_1 - 3t_1^2 = 1 \Leftrightarrow t_1 = t_2 = \frac{1}{2}$$

Grading: 0.25 for setting up the minimization problem, 0.25 for mentioning the Ramsey Rule, 0.75 for solving the first condition to find $t_1 = t_2$, and 0.5 for plugging in the constraint to find the correct values.

b) (1.25 points) If the government has fairness concerns as well, explain how your answer might change (with no additional calculations, max. 10 lines).

The Ramsey Rule only accounts for efficiency concerns, i.e., it only cares about minimizing the sum of the deadweight loss, with no concern for fairness or equity.

On equity grounds, the government could value Horizontal Equity – make sure that similar individuals are treated equally by the tax system, despite different economical choices – or Vertical Equity – make sure that wealthier individuals pay more taxes.

On Vertical Equity grounds, the government could want to charge progressive income taxes, where the average tax rate rises with income. To make the system even more progressive, tax credits (not tax deductions) could be introduced.

Alternatively, the government could maximize some sort of social welfare function instead of minimizing the deadweight loss.

Grading: 0.25 for acknowledging that the Ramsey Rule only cares about efficiency, 0.5 for discussing how can fairness/equity be defined in this context, 0.5 for presenting at least one policy suggestion.

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.