Final Exam
Public Finance - 180.365
Fall, 2004
Answers

1 Multiple Choice

Correct answer indicated by $\Rightarrow$

1. Positive economics

   (a) does not depend on market interactions.
   (b) only looks at the best parts of the economy.
   (c) $\Rightarrow$examines how the economy actually works (as opposed to how it should work).
   (d) is very subjective.

2. The Coase theorem has problems because

   (a) $\Rightarrow$generally, bargaining costs are not zero.
   (b) individuals are not concerned with others.
   (c) markets always exist.
   (d) all of the above.

3. The marginal rate of substitution is

   (a) the slope of the Pareto curve.
   (b) the slope of the contract curve.
   (c) the slope of the utility possibilities curve.
   (d) $\Rightarrow$the slope of the indifference curve.

4. The slope of the production possibilities curve is the

   (a) marginal rate of substitution.
   (b) contract curve.
   (c) $\Rightarrow$marginal rate of transformation.
   (d) offer curve.
   (e) Engel curve.

5. The First Fundamental Theorem of Welfare Economics requires

   (a) producers and consumers to be price takers.
   (b) that there be an efficient market for every commodity.
   (c) that the economy operate at some point on the utility possibility curve.
   (d) $\Rightarrow$all of the above.

6. The economic incidence of a unit tax is

    (a) generally borne by the buyers.
    (b) generally borne by sellers.
    (c) generally borne by the government.
    (d) ⇒independent of the statutory incidence for the tax.
    (e) none of the above

7. Market failure can occur when

    (a) monopoly power exists in the market.
    (b) markets are missing.
    (c) consumers can influence prices.
    (d) moral hazard and adverse selection exist
    (e) ⇒all of the above.

8. A public good is

    (a) a good that the public must pay for.
    (b) ⇒nonrival in consumption.
    (c) more costly than a private good.
    (d) paid for by the government.

9. Movement from an inefficient allocation to an efficient allocation in the Edgeworth Box will

    (a) increase the utility of all individuals.
    (b) ⇒increase the utility of at least one individual, but may decrease the level of utility of another person.
    (c) increase the utility of one individual, but cannot decrease the utility of any individual.
    (d) decrease the utility of all individuals.

10. Points on the utility possibility frontier are

    (a) inefficient.
    (b) points of incomplete preferences.
    (c) not producible.
    (d) ⇒Pareto efficient.

11. The economic theory of optimal health care provision says that

    (a) It is socially optimal for free medical treatment to be provided to everyone
    (b) Everyone should pay their own medical expenses because they will set marginal cost equal to marginal benefit.
    (c) Adverse selection can prevent efficient insurance markets from developing even when everyone buys the same insurance.
    (d) ⇒The optimal health care system will ration care: Some people who would benefit from treatment should be denied that treatment.
    (e) Moral hazard is not a problem because nobody would intentionally do something that might make them sick.

12. Market mechanisms are unlikely to provide

    (a) prices.
    (b) ⇒nonrival goods efficiently.
    (c) supply and demand.
    (d) none of the above.

13. Public goods can be

    (a) provided privately.
    (b) provided publicly.
    (c) subject to free rider problems.
    (d) ⇒all of the above.

14. Externalities can be positive because

    (a) marginal damages do not last over time.
    (b) ⇒utility can be impacted positively as well as negatively.
    (c) there is no concept for marginal benefit.
    (d) positive externalities are subsidies.

15. A Pigouvian subsidy

    (a) cannot exist with externalities.
    (b) is the same thing as a Pigouvian tax.
    (c) is measured in terms of Pigouvian dollars.
    (d) ⇒moves production to the socially optimal level of output

16. Which method can help in obtaining a welfare improvement if externalites exist?

    (a) Pigouvian taxes
    (b) regulation
    (c) assigning property rights and permitting bargaining
    (d) ⇒all of the above

17. Marginal damages

    (a) ⇒must always be considered in social marginal costs.
    (b) must not be considered in social marginal costs.
    (c) must sometimes be considered in social marginal costs.
    (d) have nothing to do with social marginal costs.

18. In a public goods context, it is difficult to measure impact on real income because

    (a) public goods are generally free to the public.
    (b) they make up a small percentage of total GDP.
    (c) ⇒it is hard to measure how people value the public good.
    (d) inflation decreases the value of the good.

19. A fully funded Social Security plan requires

    (a) negative generational accounts
    (b) no taxes since current workers pay for current retirees.
    (c) future generations to pay for the benefits of current retirees
    (d) ⇒retirees to be paid from investments that have accumulated with interest over their working lives.
    (e) all of the above.

20. Social insurance can be justified on the grounds of

    (a) adverse selection.
    (b) decision-making costs.
    (c) income distribution.
    (d) paternalism.
    (e) ⇒all of the above.

21. Statutory incidence of a tax deals with

    (a) the amount of revenue left over after taxes.
    (b) the amount of taxes paid after accounting for inflation.
    (c) ⇒the person(s) legally responsible for paying the tax.
    (d) the amount of tax revenue generated after a tax is imposed.
    (e) none of the above.

22. An *ad valorem* tax is

    (a) ⇒given as a proportion of the price.
    (b) Latin for "buyer beware."
    (c) identical to a unit tax.
    (d) computed using the "inverse taxation rule."

23. Lump sum taxes

    (a) create no excess burden.
    (b) are not as widely used as other forms of taxation.
    (c) generally lack a sense of equity.
    (d) ⇒all of the above.
    (e) none of the above.

24. If the proceeds from a Pigouvian tax are used to _____ income tax rates, then efficiency _____ in both markets.

    (a) increase; increases
    (b) reduce; reduces
    (c) increase; reduces
    (d) ⇒reduce; increases
    (e) none of the above

25. "For goods that are unrelated in consumption, efficiency requires that tax rates be inversely proportional to elasticities." This is the definition of

    (a) the benefits-received principle.
    (b) ⇒the Ramsey Rule.
    (c) the second best principle.
    (d) the inverse elasticity rule.
    (e) horizontal equity.

2   Short Discussion Questions

15pt   1. Explain why a person's decision of whether to get a flu shot causes an externality. Discuss how the size of the externality caused by any single individual's decision depends on the fraction of other individuals who also get vaccinated. Discuss whether subsidizing flu shots by making them available for free might be an optimal policy.

Answer:

For the "explain" part, see the first hour exam.

The size of the externality depends on the fraction of others getting vaccinated because if everyone else is immune, my decision not to get vaccinated will probably not matter to others, while if nobody else is vaccinated, then if I don't get vaccinated then get sick, the disease might spread widely.

A Pigouvian subsidy is an optimal response to a situation where there are positive externalities. It is possible that the optimal Pigouvian subsidy in this case would be to subsidize the entire price of the flu shot, so that flu shots would be free; it is also possible that the optimal subsidy would be more or less than the price of the flu shot.

15pt   2. Consider an economy containing two people ranked in order of their incomes; that is, their incomes are $I_1 < I_2$. Define an index of tax progressivity for this economy as $P = (T_1/I_1 - T_0/I_0)$ (a slight simplification of the measure discussed in class). Explain how you would define the term 'more progressive' in relation to this definition of P. (That is, tax code A is 'more progressive' than tax code B if a) $P_A > P_B$; or b) $P_A < P_B$.)

Now suppose $I_1 = \$10,000$ and $I_2 = \$1,000,000$. Initially the poor person pays $T_1 = \$10$ in taxes while the rich person pays $T_2 = \$100,000$. Calculate the index of progressivity.

Now suppose there is a tax cut, after which poor person now pays $T_1 = \$0$ in taxes, while the rich person pays $T_2 = \$90,000$. Calculate the index of progressivity again; is this a "progressive" tax cut using this index? In light of this point, discuss the claim made by Greg Mankiw in his lecture last week that the Bush tax cuts have been progressive because "the proportion of total income taxes paid by high-income taxpayers has actually risen in recent years."

Answer:

A is more progressive than B if $P_A > P_B$.

	T/I	
	Before Tax Cut	After Tax Cut
Poor	0.001	0.000
Rich	0.100	0.090
P	0.099	0.090

The table shows that the tax cut makes the tax system less progressive (using the proposed definition of progressivity).

But note that after the tax cut, the rich person pays 100 percent of the taxes. Before the tax cut, the poor person was paying a little bit of taxes, so the rich person was paying less than 100 percent of all taxes paid. So the tax cut increases the "proportion of taxes paid by high-income households" in this economy, even though it does not satisfy the definition of a progressive change in the tax code discussed in class.

The relationship to the Mankiw quote is obvious: The statistic he cites does not correspond to the measure of progressivity P.

12pt 3. One criticism of globalization is that when import barriers are reduced, some people lose their jobs and are made worse off; in his speech on campus last week, Greg Mankiw advocated "Trade Adjustment Assistance" (TAA) programs as a way to reduce the political opposition to free trade. Define TAA programs and explain the economic logic for why they make sense. (Your answer should relate to the concept of "Pareto improvements.")

Answer:

A Pareto improvement occurs when somebody is made better off while nobody is made worse off. Theory and evidence suggests that while overall income goes up when trade barriers are lifted, with most people winning, there are certainly some people who are made worse off, so simply lifting a trade barrier does not constitute a Pareto improvement. Trade Adjustment Assistance programs provide help to people who have lost their jobs as a result of the elimination of trade barriers; this can involve retraining, moving expenses, or even direct payments like extended unemployment insurance. If a TAA program is generous enough, in principle it can more than compensate the people who lose their jobs as a result of trade opening, and thus the elimination of trade barriers could become a true Pareto improvement.

15pt 4. In many beachfront communities on the east coast, it is impossible to buy private homeowners' insurance to protect homes against storm damage; insurance companies have found that offering such insurance at a 'reasonable' price (that is, a price that is close to the amount of damage that the typical home can be expected to sustain in a storm) is unprofitable because the damage sustained by insured homes tends to be greater than the damage sustained by uninsured homes. They have also found that nobody buys the insurance if they charge a high price. For many years the Federal government has provided some beachfront homeowners with Federal insurance. Discuss whether this is an example of appropriate government intervention to correct a market failure, and if so describe the nature of the market failure.

Answer:

This may be an example of market failure caused by either moral hazard or adverse selection or both.

Recall that moral hazard occurs when people who have insurance against a risk behave differently than they would if they had no insurance. For example, in this case it is possible that consumers with insurance would build flimsier houses or would not take any action to protect their homes in storms. (There are many things homeowners can do to reduce the likelihood of damage and the amount of damage to their homes. For instance, they can put plywood boards over their windows; they can stack sandbags around the house; and they can move furniture and valuable items off of the ground floor or basement).

It could also be an example of adverse selection if some beachfront homeowners knew that their houses were more likely to be destroyed by storms than other beachfront homes. In this case, the people with houses most likely to be destroyed would buy the insurance, and when the first storm hit the insurance company would discover that the homes it had insured sustained much more damage than the average home or than uninsured homes. This would drive the price of insurance up, and those with houses least likely to be destroyed would be priced out of the market.

However, neither of these market failures necessarily implies that the government should get involved. Government-provided insurance has the same moral hazard and

adverse selection problems as private insurance in this case. Furthermore, owners of beachfront homes are usually richer than the average household, so government provision of insurance to them constitutes a transfer of resources from the average household to richer households, and so violates the utilitarian goal of transfering money from richer to poorer households.

18pt   5. Suppose the inverse demand curve for good A is given by the equation $P_A = 10 - Q_A/10$, and the supply curve is perfectly elastic (horizontal) at \$1. Good A is presently taxed at \$2 per unit. Good B (which is independent of good A) has an inverse demand curve $P_B = 5 - Q_B/20$, and is also perfectly elastically supplied at \$1. Good B is untaxed.

(a) How much tax revenue is collected and what is the excess burden of the \$2 tax on A?

(b) How much revenue is collected if the tax on good A is reduced to \$1 per unit and good B is taxed at \$1 per unit?

(c) What is the total excess burden of taxing both goods at \$1 per unit?

(d) Which tax system is preferable from the point of view of economic efficiency?

(e) Suppose good A is a gourmet food (caviar, say) while good B is water provided by the local utility. Discuss how this might affect the conclusion about which tax is socially preferable.

Answer:

(a) Tax revenue $= (2)(70) = 140$. Excess burden $= (1/2)(2)(20) = 20$.

(b) Total tax revenue $= (1)(80) + (1)(60) = 140$.

(c) Total excess burden $= (1/2)(20)(1) + (1/2)(10)(1) = 15$.

(d) Both systems raise the same amount of tax revenue, 140, but the second system does it with less excess burden, $15 < 20$. Therefore, the second system would be more efficient.

(e) If good A is something that is mainly or exclusively bought by rich people, while good B is something that everybody needs, then it is likely that the marginal utility cost of a tax on A is less than that of a tax on B because the former mainly hits rich people with low marginal utility while the latter hits poorer people with high marginal utility. A utilitarian might therefore support the tax on A even if it is less efficient, for equity reasons.

3   Long Question

Last week, the Chairman of the Council of Economic Advisers, Greg Mankiw, gave a speech on campus in which he discussed Social Security reform.

To capture some of the points Mankiw was making, consider the following simple economy.

Define the current time as period n ('now'), and suppose there is an existing PAYG SS system in which the taxes on the current young are paid out to the current elderly; this is captured by the usual notation:

$$\tau_{y,n} = -\tau_{o,n} \tag{1}$$

Taxes on the young will remain constant at the level $\underline{\tau}$ from period n onward:

$$\tau_{y,n} = \tau_{y,n+1} = \tau_{y,n+2} = \cdots = \underline{\tau} \tag{2}$$

For purposes of this question, we are ignoring population and productivity growth. Assume that the interest rate $R = 1 + r$ is constant.

Suppose the government has promised future benefits greater than projected future taxes by a factor $P = (1 + p) > 1$ (P for 'promised'):

$$\hat{\tau}_{o,n+1} = \hat{\tau}_{o,n+2} = \cdots = -P\underline{\tau} \tag{3}$$

where the 'hat' over the variable indicates that it is a government promise rather than reality. Also assume that the government does nothing aside from running the social security system, so that government spending $G_t = 0$ for all periods.

1. Show that the 'promised' generational accounts $\widehat{GA}$ for the generations young at time n, $n+1$, and beyond, if the government could somehow make good on these promises, would be $\underline{\tau}(1 - P/R)$.

   Answer:

$$
\begin{aligned}
\widehat{GA}_n &= \underline{\tau} - P\underline{\tau}/R \tag{4} \\
&= \underline{\tau}(1 - P/R) \tag{5}
\end{aligned}
$$

   and under the given assumptions generational accounts are identical for all future generations as well.

2. Show that the primary deficit $PDEF$ for periods $t + 1$ and beyond if the government tries to make good on its promises would be

$$PDEF_{n+1} = PDEF_{n+2} = ... = p\underline{\tau} \tag{6}$$

   (Hint: Recall $T_n = \tau_{y,n} + \tau_{o,n}$ and primary deficits are spending G minus T).

   Answer:

$$
\begin{aligned}
PDEF_{n+1} &= \overbrace{G_{n+1}}^{=0} - T_{n+1} \tag{7} \\
&= -(\hat{\tau}_{o,n+1} + \underline{\tau}) \tag{8} \\
&= -(-P\underline{\tau} + \underline{\tau}) \tag{9} \\
&= -(-(1 + p)\underline{\tau} + \underline{\tau}) \tag{10} \\
&= p\underline{\tau} \tag{11}
\end{aligned}
$$

so spending more than taxes causes a primary government budget deficit in every period.

In the handout on the government budget constraint, there was an equation that related the stock of government bonds to future primary deficits:

$$B_n \;=\; (T_n - G_n)/R + [(T_{n+1} - G_{n+1})/R]/R + ... \qquad (12)$$

3. Suppose that in period n the government has no debt, $B_n = 0$. Using (12), explain why, if future taxes and benefits must be permanently constant, the only feasible plan is for the government to stop promising $p > 0$ and instead to promise $p = 0$, that is, benefits equal taxes in future periods.

   Answer:

   (12) reduces to

$$
\begin{aligned}
0 \;&=\; -p\tau - p\tau/R - p\tau/R^2 - ... & (13)\\
&=\; -p\tau(1 + 1/R + 1/R^2 + ...) & (14)
\end{aligned}
$$

   which is obviously only satisfied for $p = 0$.

4. Suppose an economist named Namgurk proposes a reform plan that consists of a cut in future promised benefits to $p = 0$. Show that under the Namgurk reform plan, the GA's for current and future generations become $GA_n = GA_{n+1} = GA_{n+2}... = \underline{\tau}(1 - 1/R)$.

   Answer:

$$
\begin{aligned}
GA_n \;&=\; \underline{\tau} - \underline{\tau}/R & (15)\\
&=\; \underline{\tau}(1 - 1/R) & (16)
\end{aligned}
$$

   and under the given assumptions generational accounts are identical for all future generations as well.

5. One point Mankiw made in his lecture was that opponents of Social Security reform would try to frame the debate by comparing how people would fare under reform plans to how they would fare under the current system. How would you make Mankiw's point using the GA framework and analysis just completed?

   Answer:

   The GA's promised by the original system were $\underline{\tau}(1 - P/R)$ while the GA's under the traditional reform plan are $\underline{\tau}(1 - 1/R)$. Since $P > 1$ the GA's look better under the fantasy that the government will actually pay the promised benefits. But this is a meaningless promise, since the numbers don't add up (the government's intertemporal budget constraint is not satisfied) in the current system. So Mankiw's point is that it is not appropriate to compare benefits promised in the current system to those under a reform proposal because the whole point of reform is to change the system from one that is not feasible to one that is feasible.

Now suppose that in our hypothetical economy an economist named Wiknam comes up with a reform proposal which diverts an amount z of people's Social Security taxes into 'individual accounts' earning interest R. But future Social Security benefits will be adjusted downward to compensate. Furthermore, Wiknam promises that *total* taxes paid by future young generations will not be increased.

In accounting for the new situation, we continue to use τ to refer to the total amount of taxes paid net of benefits received at each age. Since the proposal does not change the amount of taxes being paid by the young generation at time n (it merely diverts z into individual accounts),

$$\tau_{y,n} \;\; = \;\; \underline{\tau}, \tag{17}$$

which is the same as before the Wiknam reform. We call the amount *not* diverted into the individual accounts $t_{y,n} = \underline{\tau} - z$, so that total taxes are t plus individual account taxes, $\tau_{y,n} = t_{y,n} + z$.

This proposal would be politically impossible if it involved cutting benefits for the existing elderly, so the Wiknam plan runs budget deficit of size z in period n, to cover the 'transition cost' to the new system; in the proposal, the debt is never paid back - every subsequent generation simply pays the interest on this 'transition debt,' at rate r; this amounts to a permanent 'transition tax' of rz. The young generation in period $n+1$ must make their own contributions to individual accounts z; the promise that their total taxes will not rise means that

$$\tau_{y,n+1} \;\; = \;\; t_{y,n+1} + z + rz = \underline{\tau} \tag{18}$$
$$t_{y,n+1} \;\; = \;\; \underline{\tau} - (1+r)z. \tag{19}$$

Social Security benefits to the elderly are whatever is left of taxes on the young after deducting revenues into the individual accounts and revenues being used for transition taxes; thus

$$\tau_{o,n+1} \;\; = \;\; -\left(\underbrace{(\underline{\tau} - Rz)}_{t_{y,n+1}\text{ from }(19)} + Rz \right). \tag{20}$$

For the generation young in period $n+1$, the promise that taxes on the young will never rise leads to the corresponding conclusions that

$$\tau_{y,n+1} \;\; = \;\; \underline{\tau} \tag{21}$$
$$\tau_{o,n+2} \;\; = \;\; -(t_{y,n+2} + Rz) \tag{22}$$
$$t_{y,n+2} \;\; = \;\; \underline{\tau} - Rz. \tag{23}$$

6. Calculate the generational accounts for the generations young at time n, $n+1$, and $n+2$ and beyond under the Wiknam plan, and compare them to the generational accounts associated with the Namgurk plan.

   Answer:

$$GA_n \;\; = \;\; \underline{\tau} - (\underline{\tau} - Rz + Rz)/R \tag{24}$$
$$= \;\; \underline{\tau}(1 - 1/R) \tag{25}$$
$$GA_{n+1} \;\; = \;\; \tau_{y,n+1} + \tau_{o,n+2} \tag{26}$$
$$= \;\; \underline{\tau} - \underline{\tau}/R \tag{27}$$
$$= \;\; \underline{\tau}(1 - 1/R) \tag{28}$$

and the same is true for GA_{n+2} and beyond. This is is the same for every generation as the Namgurk proposal.

Thus, in terms of how it treats different generations, this reform is identical to just cutting benefits. All the stuff with individual accounts is a shell game - smoke and mirrors to try to hide the fact that the only way to fix the system without raising taxes is to cut benefits from the infeasible original promises.

7. Show that the pattern of primary deficits implied by the Wiknam and Namgurk proposals is

	Period			
	n	$n+1$	$n+2$	...
Wiknam	z	-rz	-rz	-rz
Namgurk	0	0	0	0

where the column labelled ... applies to all periods beyond $n+2$. Show that both of these patterns satisfy the government intertemporal budget constraint (12). (Hint: A math fact is that the infinite sum $1 + 1/R + 1/R^2 + ... = 1/r$). Use this result to discuss the claim that Greg Mankiw made in his lecture that we shouldn't worry about the deficits caused by Social Security reform proposals because they are basically accounting labels that don't capture the underlying reality of the problem.

Answer:

Equation (12) obviously holds for the Namgurk pattern of deficits, since it simply says 0=0. For the Wiknam proposal, the equation says

$$
\begin{align}
0 &= z/R - z(r/R + r/R^2 + r/R^3 + ...) \tag{29} \\
&= z(1/R - r/R(1 + 1/R + 1/R^2 + ...)) \tag{30} \\
&= (z/R)(1 - r/r) \tag{31} \\
&= 0 \tag{32}
\end{align}
$$

where we used our math fact in line 3.

The table provides justification for Mankiw's point; since the generational accounts are identical for the two reform plans (and indeed, the payments made and received in every period by every individual are identical in the two plans), the fact that they have different effects on the measured primary deficit suggests that the primary deficit is an imperfect measure of what is going on.

8. In the Wiknam proposal, the 'transition debt' is never paid off - only the interest is paid in each period, keeping the size of the debt the same forever. Suppose someone criticizes the Wiknam proposal as fiscally irresponsible, and proposes instead that the debt should be paid off within one generation, by imposing higher taxes $\tau_{y,n+1}$; taxes on subsequent young generations will go back to $\tau_{y,n+2} = \underline{\tau}$. Discuss the effects on the generational accounts of all generations of this plan compared to the Wiknam plan. (You need not calculate the generational accounts algebraically; you should be able to figure this out intuitively, though an algebraic answer would be accepted).

Answer:

This constitutes a worsening of the generational accounts for the generation that is young at time $n+1$ because they are paying higher taxes but not receiving higher

benefits. Basically, they will be paying for the retirement of two generations: Their own and that of their parents.

It is an improvement in the generational accounts of all future generations beyond period $n + 1$ because they no longer have the 'transition debt' to pay for.