Final Exam

14.41 Public Finance and Public Policy

1 Short Answer [40 points, 4 points each]

(1) Many of the United Kingdom's largest metropolitan areas have recently formed "Combined Authorities" that centralize control of transportation infrastructure investment, taking control away from the central city and suburban town governments. Explain why this reorganization should increase the equilibrium level of investment in a metropolitan area.

Answer: There are interjuridisctional externalities of transportation infrastructure investment: When one town improves its roads, for example, the benefits spill over onto user from other towns who are passing through. If local governments made decisions to maximize their own town citizens' welfare, they would not internalize these spillover benefits and thus under-provide infrastructure. By centralizing control through a Combined Authority (CA), spillovers become gains of CA residents, which the CA does internalize. This leads to a higher equilibrium level of infrastructure. Students may have also appealed to economies of scale in infrastructure provision—we gave partial credit for that answer.

(2) The mayor of Largetown proposed a tax on sodas larger than 16 ounces in an effort to combat rising obesity rates. Coca-Cola immediately reacted saying that the government was being paternalistic and should let people choose what to consume. They argued that soda is not addictive so it shouldn't be taxed. Suppose everything Coca-Cola said is true, under which conditions would it still be optimal to introduce the soda tax? If, in general, consuming soda does have negative externalities, is the proposed tax the best way to internalize them?

Answer: Even if there is no direct externality of consuming soda, there are still externalities imposed by obesity. For example, if health insurance premiums aren't adjusted based on weight, then the additional health costs will be partly borne by the non-obese. Employers might also suffer by having less productive workers and not being able to adjust wages for obese workers due to non-discrimination laws. We could also be concerned that people are acting irrational by not accounting for the future costs of consuming soft drinks (in increased health spending). As long as the costs associated with with soda consumption are larger than the benefits, then it would be optimal to pass the tax.

The tax would help but won't be able to internalize all the externalities since people would likely substitute to smaller sodas which remain untaxed, have lower relative prices and also have negative externalities.

(3) While climate scientists have stressed the potential damages from climate change, economists are less certain about the costs of mitigating greenhouse gases. Suppose that total benefits of a given level of abatement a are known with certainty and given by $B = 6ln(a)$. The cost of abatement is uncertain: there is equal probability that it will be either $C_1 = \frac{1}{2}a^2 + ga + 16$ or $C_2 = \frac{1}{2}a^2 + (g-1)a + 15$ for some value of $g \in (-\infty, -5) \cup (-4, \infty)$. Which regulatory mechanism (i.e. price or quantity), should the government choose to minimize deadweight loss?

Answer: The choice depends on the value of g. As long as $g > -4$, the slope of the marginal benefits from reduction will always be greater than the slope of the marginal cost at the

optimal level of abatement. In this case we would prefer quantity regulation. In the other hand, when $g < -5$ the opposite is true and thus price regulation is preferred.

(4) Since the 2017 tax reform, state-and-local tax payments are partially deductible on the federal income tax. Is this consistent or inconsistent with the Haig–Simons definition of income? Discuss.

Answer: Haig–Simons income is defined as annual consumption plus the change in the stock of wealth. The key question here is whether the state-and-local tax payments are a way of buying consumption of local public goods (as in the Tiebout model) or if these taxes are at least partially redistributive. It seems clear that state and local government do some redistribution, so partial deductibility of such taxes is partially consistent and partially inconsistent with the Haig–Simons income concept.

(5) "While the optimal carbon tax does not depend on the supply or demand elasticities of carbon emissions, the deadweight loss from not taxing carbon does." Explain why.

Answer: The optimal carbon tax should be set to equal the marginal social cost of carbon emissions: $\tau = c$. It does not depend directly on elasticities. We can show using the DWL formula, however, that the DWL of not taxing carbon depends on elasticities:

$$\text{DWL} = \frac{1}{2}\frac{\eta_s \eta_d}{\eta_s - \eta_d} c^2,$$

where c is the social cost of carbon and η_s, η_d are respectively the emissions supply and demand elasticities. Given some tax, the difference between the social cost and the tax on carbon would control the DWL, along with the elasticities.

(6) Under the child care tax credit, taxpayers can reduce their income tax bill by \$0.20 for every \$1 in child care expenses they pay. Suppose you wanted to predict the incidence of an increase to a 40-percent credit. Which two elasticities do you need? For one of them, propose a quasi-experimental design that would allow you to estimate it, and make up its value. Is any class material informative about the other elasticity?

Answer: The incidence formula

$$\frac{\Delta p / p}{\Delta(1-\tau)/(1-\tau)} = \frac{\eta_d}{\eta_s - \eta_d}$$

tells us that we need the supply and demand elasticities for child care. The demand for childcare is something we can infer from the secondary-earner labor supply elasticity, since the main alternative to child care is being a stay-at-home parent. We know this labor supply elasticity is between 0.5 and 1 (p.663 of textbook), so let's say $\eta_d = -0.75$.

We can use a quasi-experiment to estimate the supply elasticity of child care. The quasi-experiment needs to feature an increase in demand. One such quasi-experiment might be local "baby booms" and generational cycles in fertility. Another would be changes in state subsidies over time. (We will be open to any well-explained idea here.)

(7) Suppose that the McDonald's Corporation faces a statutory corporate tax rate of $\tau = 21$ percent. To simplify, we will say that McDonald's has one type of capital asset, which depreciates exponentially at $\delta = 20$ percent per year. There is no investment tax credit. McDonald's discount rate is $\rho = 8$ percent per year. What is McDonald's effective corporate tax rate?

Answer: We first use our PDV formula to obtain the PDV of tax savings from the depreciation of \$1 of investment:

$$\begin{aligned} z &= \$0.20 + (1-0.08)(\$1-\$0.20)(\$0.20) + (1-0.08)^2(\$1-\$0.20)^2(\$0.20) + \dots \\ &= \frac{\delta}{1-(1-\rho)(1-\delta)} = \frac{\$0.20}{1-(1-0.08)(1-\$0.20)} = 0.758. \end{aligned}$$

Then we consider the effective tax rate formula:

$$\text{ETR} = \frac{\tau - \tau z - \alpha}{1 - \tau z - \alpha} = \frac{0.21(1-0.758)-0}{1-(0.21)(0.758)-0} = 0.060,$$

where α is the investment tax credit. So we would say that McDonald's effective corporate tax rate is 6.0 percent.

(8) The U.S. income tax code allows investors to reduce their tax burden by deducting losses in prior years from their current taxable investment income, but they cannot receive a tax refund. How does this "carryforward" rule affect risk-taking? Compare the rule to one in which investors with large losses could receive an immediate tax refund. Why might the U.S. have the "carryforward" rule, instead of this option?

Answer: Because loss-carryforward rules delay savings from less capital-gains tax payments, relative to immediately receiving a refund, they provide less insurance against losses to investors. By the logic of the Domar–Musgrave model, loss carryforwards encourage less risk-taking by investors than a rule in which they could immediately get a tax refund. However, the loss-carryforward rule prevents people from setting up corporations that intentionally achieve large "paper" losses for the purpose of getting a tax refund. The loss-carryforward rule restricts these tax savings (upon a delay) to companies that at some point would have positive earnings.

(9) In the 1970s, Yale University offered incoming students a choice between two ways of financing their tuition: a traditional loan or a repayment plan that would "tax" a share of their income over their lifetime—one approximately equal to the value of the loan as a share of the average Yale graduate's lifetime income. This experiment was a disaster, costing Yale millions of dollars in the long run. Explain the key economic flaw with Yale's plan.

Answer: The flaw is adverse selection due to asymmetric information. Yale students knew more about their future lifetime income than Yale did—for example, they knew if they wanted to pursue high-paying careers in finance or lower-paying careers in the nonprofit sector. The high-earning students should select the loan, and the low-earning students should select the "tax" plan, since these minimize their respective PDV repayments to Yale. This adverse selection caused Yale to lose money because the plans were "priced" as if students choosing the "tax" plan were not negatively selected on future earnings.

(10) In 2018, the Swiss government began sharing once-secret data on Americans' foreign bank accounts with the U.S. government, making it harder for the super-rich to evade taxes. Explain how this policy change changes the maximum amount of revenue that can be raised by the U.S. income tax system.

Answer: There is a direct effect and an indirect effect of the policy change. The direct effect is that, at any given tax rate, the income tax will raise more revenue because there is a lower rate of evasion. The indirect effect is that the elasticity of taxable income with respect to the

tax rate (η) is lower, because the super-rich lost one of the ways they might respond to higher taxes, which implies (by $\tau^* = 1/(1+\eta)$), that the revenue-maximizing tax rate is now higher. Both the direct and indirect effects therefore imply more income tax revenue.

2 All in the Family [45 points]

Consider a simple model of an economy with identical workers who earn labor income of w when working and receive non-labor income of 5 regardless of their employment status. Individuals have identical utility functions and consume everything they earn (i.e. there is no saving) $u(c) = \ln(c)$. All workers start out employed and then lose their jobs with probability p and receive 0 in labor income.

(a) In the absence of unemployemnt insurance, what is the expected utility of each worker? [3 points]

Answer: Using the probabilities above, workers have expected utility

$$(1-p)\ln(w+5) + p\ln(5)$$

(b) The government is considering implementing unemployment benefits of b, financed by a lump sum tax τ on the $(1-p)$ workers who do not lose their initial jobs. What is the government's budget constraint for an actuarially fair insurance program? [3 points]

Answer: An actuarially fair program pays out exactly as much as it takes in, so the budget constraint is

$$(1-p)\tau = pb$$

(c) Solve for the optimal level of benefits and the associated tax. What is the level of consumption smoothing provided by the unemployment benefits? [4 points]

Answer: To find the level of optimal benefits we have to maximize utility when unemployment insurance is available subject to the government's budget constraint. [6 points]

$$\max_{b,p}(1-p)\ln(w+5-\tau) + p\ln(5+b) \quad s.t. \quad (1-p)\tau = pb$$

Substituting for τ we can solve the unconstrained problem taking the first order condition with respect to b :

$$(1-p)\frac{p}{1-p}\left[\frac{1}{w+s-\frac{pb}{1-p}}\right] = \frac{p}{5+b}$$

$$5+b = w+5-\frac{pb}{1-p}$$

$$w = \frac{(1-p)b+pb}{1-p}$$

$$b = w(1-p)$$

Thus, the optimal system provides full consumption smoothing: workers get their full expected wages in unemployment benefits, so consumption is the same in both the employed and unemployed state. You can see this by plugging the b we found in the utility function.

(d) Are there gains or losses from introducing insurance? How does the form of the utility function affect the desirability of a UI system? [4 points]

Answer:

Workers would rather have the guarantee of expected consumption than to take the "bet" of becoming unemployed and not having insurance. This result is due to the fact that the utility is concave, implying that workers are risk averse. If instead, workers were risk-neutral, unemployment insurance wouldn't have any effect on them. If, in the other hand, the utility function was convex (i.e. workers were risk-loving), then they would be hurt by insurance since they'd prefer to take the risk of being unemployed.

(e) Suppose now that, in addition to their non-labor income, when workers lose their jobs they receive support from their family, expressed by F where $F < (1-p)w$. Calculate the optimal level of unemployment benefits accounting for the family contribution. How does this compare to the level in part (c)? [5 points]

Answer: Now we have to account for the quantity F that workers receive from their families in the case of unemployment. Their maximization problem can now be written as:

$$max_{b,p}(1-p)\ln(w+5-\tau)+p\ln(5+b+F) \quad s.t. \quad (1-p)\tau = pb$$

Again we substitute for τ and take the first order condition with respect to b.

$$(1-p)\frac{p}{1-p}\left[\frac{1}{w+s-\frac{pb}{1-p}}\right] = \frac{p}{5+b+F}$$

$$5+b+F = w+5-\frac{pb}{1-p}$$

$$w-F = \frac{(1-p)b+pb}{1-p}$$

$$b = (w-F)(1-p)$$

Optimal unemployment benefits are lower than in part (c), since workers now receive a family contribution, making their loss smaller. Benefits are still positive though. Note that if we didn't know the family contribution, we would over-provide unemployment insurance.

(f) Suppose now that instead of a fixed amount as above, families help during unemployment by providing a fraction f of the net income loss, i.e. $f(w-b)$, where b is the unemployment benefit. What level of unemployment benefit would the government like to provide now (solve in terms of f)? [4 points]

Answer: Now family contribution is partly determined by the choice of b. We set up the maximization problem

$$\max_b (1-p)\ln(w+5-\frac{pb}{1-p})+p\ln(5+f(w-b)+b)$$

And taking first order conditions:

$$\frac{p}{w+5-\frac{pb}{1-p}b} = \frac{p(1-f)}{5+fw+(1-f)b}$$

$$5+fw+(1-f)b = (1-f)(w+5-\frac{p}{1-p}b)$$

$$(1-f)b[1+\frac{p}{1-p}] = (1-2f)w-5f$$

$$(1-f)b\frac{1}{1-p} = (1-2f)w-5f$$

$$b = \frac{(1-p)}{1-f}\left[(1-2f)w-5f\right]$$

Needless to say, this expression is a bit less intuitive than those we found earlier, but it does roughly balance consumption smoothing across states.

(g) In the model of part (f), what would the optimal benefit level be if $f = 1/3$ and the wage was $w = 14$. [2 points]

Answer: We use the expression above and substitute for $f = 1/2$ and $w = 14$.

$$b = \frac{3}{2}(1-p)(\frac{14}{3}-\frac{5}{3}) = \frac{9}{2}(1-p)$$

(h) How does your answer change if $f = 1/2$. Explain this result. Is this likely to be politically feasible? [4 points]

Answer: We use the expression above and substitute for $f = 1/2$.

$$b = 2(1-p)(-5/2) = -5(1-p)$$

This would imply that the benefit is negative, or in other words, that we should tax people when they are unemployed. The government wants to do this as a way to undo the large benefit people get from their families in the unemployed state. This is unlikely to be politically feasible as voters would deem the measure unfair.

Thus, when designing optimal policy we have to take into account how people smooth consumption during unemployment.

(i) Suppose the government decides to increase coverage from 26 weeks to 39 weeks (i.e. a 13-week coverage increase). They hire you as an advisor and show you a table comparing the unemployment duration of individuals who receive UI and those who do not. The table shows that people who receive UI benefits remain unemployed for longer than people who don't receive benefits. They tell you that this proves that UI causes longer unemployment duration and the 13 weeks of additional coverage should be eliminated.

(a) Is their claim correct? Why or why not? [4 points]

Answer: The claim isn't correct. The table reveals a correlation but not necessarily a causal effect. An alternative explanation that could rationalize the observed pattern in the graph is that people who know they can find another job easily don't apply for UI because it's not worth it. The key is that who received UI is not random so there could be differences between the groups that account for the difference in outcomes.

(b) Propose an empirical strategy that would be better for understanding the relationship between UI generosity and unemployment duration. State which natural experiment would help you (you can describe the one discussed in the book or come up with another one). [5 points]

Answer: Bruce Meyer's 1989 study.

(c) If UI causes longer unemployment duration, does this prove that the generosity of the program should be reduced? Why or why not? [5 points]

Answer: No, for different reasons. First, longer duration of unemployment could lead to better job matches which is a benefit to society. We wouldn't want a lawyer to become a gardener just because it takes longer to find a good position at a law firm. As benefits are more generous it allows people to increase the time of their job search. However, this doesn't seem to be a concern in reality. Meyer finds that people who are unemployed longer do not get higher wages. Second, to say something about whether the program should reduce its generosity we would need to know who is being affected how. There might be heterogeneous effects, for example think of a world with two type of people: rich lazy people, who can get a job whenever they want; and poor hardworking people who have a harder time getting a new job. While reducing generosity would induce the rich lazy people to look for a job harder, it would also hurt the poor people who are already looking as hard as possible. We need to decide how to value this trade off.

3 "The Best Insurance That Money Can't Buy" [40 points]

Consider a household earning an annual income y which has preferences $u(c, m, l)$ over consumption c, medical expenses m, and leisure l. The utility function obeys a standard property: marginal utility is always positive but diminishing in c, m, and l.

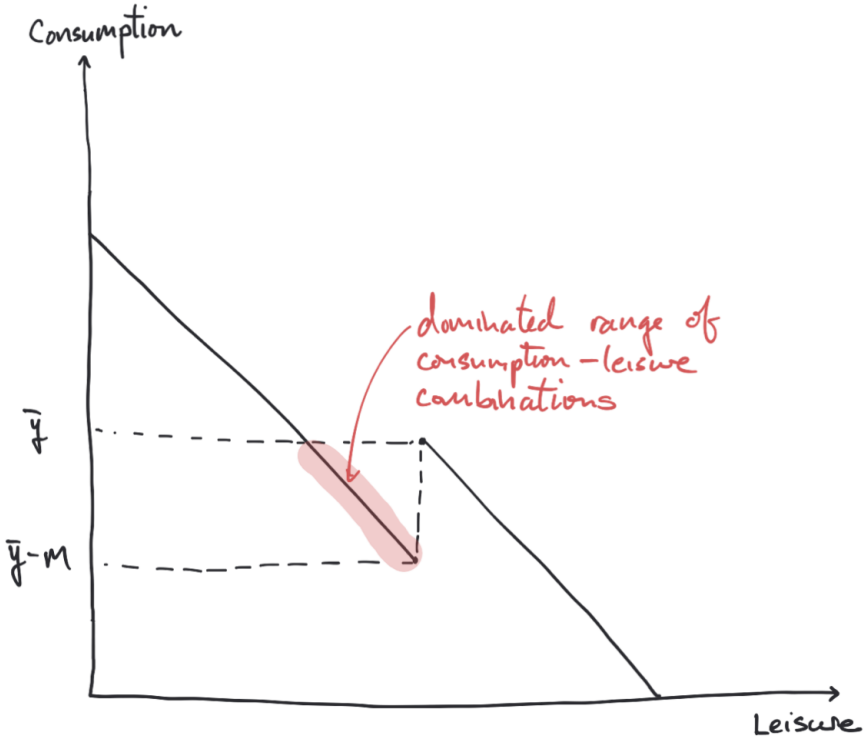
(a) Suppose that the household lives in a U.S. state where only households with incomes below $\bar{y}$ are eligible for Medicaid. The state pays for its Medicaid policy by a flat payroll tax rate τ. Draw the household's budget set in consumption–leisure space. [6 points]

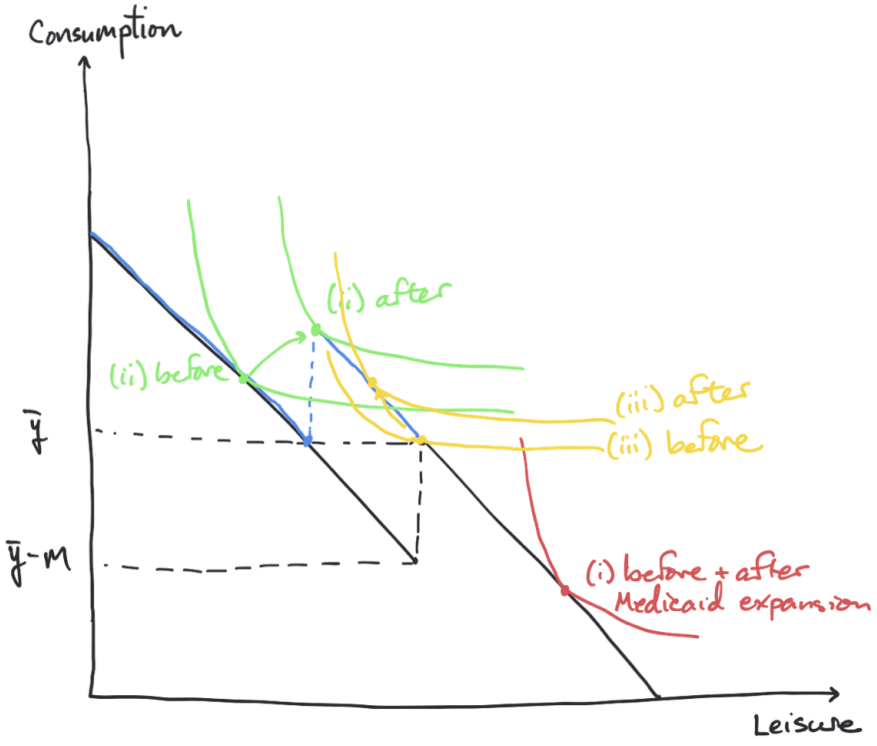
Answer:

(b) What is the slope of the budget constraint? Are there any discontinuities? Are there any ranges of income y that no household would choose to earn? [3 points]

Answer: The slope of the budget set is $-(1-\tau)w$, the negative of the after-tax wage. There is a discontinuity at the eligibility threshold $\bar{y}$, at which consumption drops because the household earning just more than $\bar{y}$ suddenly does not receive Medicaid. Earning just more than $\bar{y}$ causes total income (inclusive of the value of Medicaid) to fall, so no household would choose to earn between $\bar{y}$ and some $\bar{y} - m$, since they could have both more income and more income and more leisure by earning just less than $\bar{y}$.

(c) The state chooses to expand Medicaid eligibility from $\bar{y}$ to $\bar{Y}$, where $\bar{Y} > \bar{y}$. It does so with federal dollars, so the payroll tax rate does not change. Draw the new budget set versus the old budget set. Identify a household whose labor supply will (i) be unaffected by the policy change, (ii) decrease due to the policy change, and (iii) increase due to the policy change. [9 points]


Consumption
dominated range of consumption–leisure combinations
y1
y1-M
Leisure


Consumption
(i) after
(ii) before
(iii) after
(iii) before
(i) before + after Medicaid expansion
y1
y1-M
Leisure

Answer:

(i) The two possible households whose labor supply would be unaffected by the eligibility expansion are one earning much less than $\bar{y}$ and one earning much more than $\bar{Y}$. The very-low-wage household would have to choose to work implausibly many hours to jump to the newly-eligible income range, and the very-high-wage household would still have to accept a huge drop in income to get on Medicaid, even at the higher eligibility threshold.

(ii) A household whose labor supply falls is one who earns just more than $\bar{Y} > \tilde{y}$. Such a household was not in the old Medicaid "notch" but would not fall in the new Medicaid "notch."

(iii) A household whose labor supply rises is one who chooses to earn between $\bar{y}$ and $\bar{y}$ *after* the eligibility expansion. All households who choose to earn in this income range were previously deterred by the old Medicaid notch and so earned exactly $\bar{y}$ to become Medicaid-eligible.

(d) The U.S. spent $639 billion on the Medicaid program in 2019. It could have simply transferred these resources to low-income households as a cash benefit. Provide and explain three distinct reasons for an in-kind benefit in the case of Medicaid. [12 points]

Answer:

(i) Paternalism: Individual are, due to some behavioral issue (e.g., myopia), unable to maximize their own individual utility functions, in particular that they underinvest in health care.

(ii) Inefficiency in insurance market or WTP for insurance: In-kind benefits in the form of health insurance may be more valuable than cash to the household if there is some friction in the insurance market (e.g., adverse selection). Some students also mentioned that governments may have economies of scale or other cost advantages, relative to private insurance.

(iii) Failure of household utility maximization: To be relevant to Medicaid policy, inefficient intra-household bargaining would have to cause the household to under-invest in child health relative to a household that maximizes its collective utility. Providing insurance may distort the household's choices back to the first-best.

(iv) Externalities: An example of health care with positive externalities is getting vaccinated. Households may not get vaccinated even if the social returns are positive, as without Medicaid, getting the vaccine may be privately costly, and they are not compensated for bearing these private costs. By subsidizing health insurance, it may raise the equilibrium vaccination rate towards the socially-efficient level.

(v) Fiscal externalities: If spending $1 on child health raises later-in-life pre-tax income by more than a $1 cash transfer, then Medicaid may have an important "fiscal externality." That is, if their average implicit MTR is high, then the government captures most of the income as tax revenue, which may offset some of the cost of Medicaid in present value terms. Insofar as most children who grew up on Medicaid do not earn much as adults, they are exposed to high implicit MTRs, so there may be close to $1 in fiscal externality per $1 in additional pre-tax earnings.

(vi) Targeting/ordeals: If insurance is more valuable on the margin to low-wage households rather than high-wage households, then the provision of in-kind benefits will have good screening properties. That is, the additional $1 in Medicaid induces fewer high-wage households to "masquerade" as low-wage households (by earning less), since their benefit of masquerading increases by less than under a cash transfer.

(e) Medicaid reimburses providers below-market rates, and as a consequence, not all U.S. doctors accept new Medicaid patients, and Medicaid patients often have to spend more time searching for doctors than if they had private insurance. Provide an economic rationale for low provider reimbursement rates, instead of other cost-saving policies, such as increasing copayments. [5 points]

Answer: The trade-off in provider reimbursement rates is between allocative efficiency and productive efficiency. The ordeal of searching for a doctor makes Medicaid enrollees worse off, but it makes high-wage earner enrollees particularly worse off, because the opportunity cost of spending time trying to find a doctor is especially high. However, imposing these costs can improve allocative efficiency, since it will screen out some high-wage earner enrollees, allowing in-kind program to more efficiently target the neediest enrollees (who are willing to call around to find a doctor if it means they get very heavily subsidized health care). Some students also mentioned that low rates may be a way of addressing provider-side moral hazard—that is, to provide excessive care—which is another good answer.

(f) Unlike in the TANF program, the U.S. government does not pursue child-support claims against the "deadbeat dads" of children raised in single-mother households on Medicaid. Should it? Discuss at least one economic argument in favor of it and one argument against it. [5 points]

Answer:

- In favor: Pursuing deadbeats may discourage the formation of single-mother households, and this may be good for children in the long-run to grow up with fathers at home.
- Against: Deadbeats are typically low-earners. Reducing their income to pay for Medicaid is unlikely to be progressive and can possibly result in increased transfer payments to the deadbeats, saving no money on net, while imposing costs on the government of tracking down the deadbeats.

4 We Were Never Retired in Eastasia [55 points]

The government of Eastasia wants your help in designing a new old-age pension system. In Eastasia, citizens live for two periods but can only work in their first period of life. All citizens have the following utility function:

$$u(c_1, c_2, h) = \sqrt{c_1} + \beta\sqrt{c_2} - \frac{h^2}{2},$$

where c_1 and c_2 are respectively consumption in the first and second period, h is labor hours, and the discount factor is $\beta < 1$. Workers in Eastasia also have access to a savings account that pays a per-period interest rate r. Assume that labor demand in Eastasia is infinitely elastic at a wage w.

(a) Suppose for now that there is no pension system and no taxes. Write down the citizen's optimization problem and intertemporal budget constraint. Find the first order conditions for c_1, c_2, and h in terms of a Lagrangian multiplier λ and other parameters. [6 points]

Answer: The citizen's problem is

$$\max_{c_1,c_2,h} \left\{ \sqrt{c_1} + \beta\sqrt{c_2} - \frac{h^2}{2} \right\} \quad \text{s.t} \quad c_1 + \frac{c_2}{1+r} \leq wh.$$

This yields the following FOCs:

$$\begin{aligned} [c_1] &: \frac{1}{2}c_1^{-1/2} - \lambda = 0 \\ [c_2] &: \frac{\beta}{2}c_2^{-1/2} - \frac{\lambda}{1+r} = 0 \\ [h] &: h - \lambda w = 0. \end{aligned}$$

(b) Let $\beta = 0.8$ and $r = 0.10$. What is the equilibrium savings rate s^*? (*Hint:* The savings rate is defined as savings as a fraction of total compensation. You can use your results above for c_1 and h to obtain a savings rate which does not contain λ.) [5 points]

Answer: Combining the first two conditions, we have

$$c_2 = \beta^2(1+r)^2 c_1,$$

and using the budget constraint, we can write

$$c_1 = \frac{\lambda w^2}{1+\beta^2(1+r)}.$$

Then also notice that labor income $wh = \lambda w^2$, and so the savings rate is

$$s^* = 1 - \frac{c_1}{wh} = \frac{\beta^2(1+r)}{1+\beta^2(1+r)}.$$

For $\beta = 0.8$ and $r = 0.10$, we obtain

$$s^* = \frac{(0.8)^2(1+0.10)}{1+(0.8)^2(1+0.10)} \approx 0.41,$$

so the savings rate is about 41 percent.

Under the Eastasian government's proposal, each citizen will get a new special savings account, into which their employer must deposit on their behalf $\$\tau$ for every \$1 in wage income the citizen is paid. Citizens may also keep their private savings accounts, but they cannot add to or subtract from their special accounts until the second period.

(c) If Eastasian citizens were to save nothing on their own, what is the employer contribution rate τ that would achieve a total savings rate s^*? (*Hint*: Remember that a citizen who earns an hourly wage w receives total hourly compensation, including the employer contribution, of $(1+\tau)w$.) [3 points]

Answer: The contribution rate τ that achieves a total savings rate s^* is

$$\frac{\tau}{1+\tau} = s^* \implies \tau^* = \frac{s^*}{1-s^*}.$$

(d) Suppose the government chooses $\tau = 0.3$. Find, in the new equilibrium, the total savings rate and private savings rate. Discuss intuitively. [6 points]

Answer: The citizen's special savings account and her personal savings account are perfect substitutes, so forced saving will crowd-out private saving one-for-one. The household was saving 41 percent of income before the new pension system. When the employer contributes \$0.30 per \$1 in wage income in the government account, the citizen will save only $s^*(1+\tau) - \tau = (0.41)(1+0.3) - 0.3 = \$0.23$ per \$1 of total compensation in her private account, implying a savings rate of 18 percent ($0.23/1.3 = 0.18$), so as to leave the savings rate unchanged:

$$\frac{\$0.30 + \$0.23}{\$1 + \$0.30} = 0.41.$$

Therefore, the private savings rate falls to 18 percent but the total savings rate (i.e., encompassing the forced savings) does not change.

(e) How does the hourly wage change when the new savings account is introduced? How do hours change? Explain intuitively how these two results are compatible with an upward-sloping labor supply curve. [5 points]

Answer: As labor demand is perfectly elastic, the "after-contribution" hourly wage is fixed, and therefore the wage must fall by 30 percent when the new pension system is introduced.

Hours do not change, as the marginal disutility of labor is equated with the after-contribution hourly wage, which we have said is unchanged.

Normally, we think that hours should fall when hourly wages fall, because the labor supply curve is upward sloping. Yet here we have a fall in the hourly wage with no change in hours. This is because the relevant wage in the labor-supply decision is the after-contribution hourly wage.

(f) How do wages and hours respond to increases in the employer contribution rate τ when $\tau > s^*/(1-s^*)$? Is there still "full shifting" of the employer contribution? Explain, and discuss intuitively how your answer differs from part (d). [8 points]

Once $\tau > s^*/(1-s^*)$, private saving has been fully crowded-out, and any further increases in τ increase total saving. Since citizens can no longer optimally allocate consumption across periods, the marginal utility of the next \$1 in savings is less than had the \$1 been paid as wages. Consequently, the increase in τ reduces labor demand by more than it increases labor supply. It follows that labor hours now fall as τ increases. Hourly wages are still decreasing in τ, with "full shifting" in that wages fall one-for-one with the employer contribution. This is because labor demand is infinitely elastic so employers cannot bear incidence.

(g) Now suppose that aggregate labor demand is not infinitely elastic. Discuss how wages respond to increases in τ, both when $\tau < s^*/(1-s^*)$ and when $\tau > s^*/(1-s^*)$. Is there still "full shifting" of the employer contribution? [8 points]

Answer: When $\tau < s^*/(1-s^*)$, there is full-shifting, even with elastic labor demand, since the citizen reoptimizes their private saving choices to exactly undo the government's mandatory saving policy.

When $\tau > s^*/(1-s^*)$, the citizen cannot undo the mandatory saving policy. We showed in part (e) that increases in τ reduce labor demand by more than they increase labor supply.

Now we have less-than-full shifting: A $1 increase in the employer's contribution yields a less-than-$1 decline in wage income, so the after-contribution wage rises. Note that now we can have less-than-full shifting because labor demand is not infinitely elastic, so employer can bear some incidence.

(h) Explain how the following features of the actual U.S. Social Security system affect the extent of shifting of the payroll tax, relative to Eastasia's system [3 points each]:

(i) The PIA is a progressive function of the AIME.

Answer: The progressivity of the PIA formula undermines the tax–benefit linkage in the U.S. payroll tax versus Eastasia's system. Thus, there is less of an offsetting labor-supply increase effect from the payroll tax, so less shifting of the payroll tax into wages.

(ii) The typical retirement account is less heavily invested in lower-return assets, such as U.S. Treasury bonds, than the Social Security Trust Fund.

Answer: Our full-shifting result depends on $1 in your special account is equivalent to $1 in your private savings account. This is not true in the U.S., as the typical American saver can obtain a higher return by saving privately than via Social Security. Thus, there is less of an offsetting labor-supply increase effect from the payroll tax, so less shifting of the payroll tax into wages.

(i) Discuss intuitively whether there would be more or less shifting of the employer contribution in the following cases. Assume labor demand is not infinitely elastic. [4 points each]

(i) Some Eastasian workers have self-control problems when it comes to saving (and are aware of their self-control problem).

Answer: Forced saving is great for people with self-control problems. Such workers would be willing to give up *more* than $1 in wage income for $1 in forced savings. Thus, there will be more shifting in this case—indeed, possibly "more-than-full" shifting of the employer contribution.

(ii) Some Eastasian workers are precautionary savers, because they face the risk of an expensive health emergency during the first period.

Answer: Precautionary saving is a drawback of a forced savings plan, since you can't access your special account in a health emergency. Such workers would be willing to pay less than $1 in wage income for $1 in forced savings. Thus, there will be less shifting in this case.

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