

TOPIC 4 – PART 2 REVIEW QUESTIONS

Questions 1 – 7 relate to the following information.

Consider a transboundary pollution game between two identical countries where the payoff to country 1 is

$$u_1(y_1, y_2) = 100y_1 - 2y_1^2 - 2(y_1 + y_2)y_1$$

and the payoff to country 2 is

$$u_2(y_1, y_2) = 100y_2 - 2y_2^2 - 2(y_1 + y_2)y_2$$

In the context of the game from the lecture notes, in this example, $\nu = 100$, $\omega = 2$ and $\delta = 2$.

1. The best-response function for country 1 is

A. $y_1(y_2) = \frac{50 - y_2}{4}$

B. $y_2(y_1) = \frac{50 - y_2}{4}$

C. $y_1(y_2) = \frac{25 - 3y_2}{4}$

D. $y_1(y_2) = \frac{50 - y_2}{3}$

2. The best response function for country 2 is

A. $y_2(y_1) = \frac{25 - 3y_2}{4}$

B. $y_1(y_2) = \frac{50 - y_2}{4}$

C. $y_2(y_1) = \frac{50 - y_1}{4}$

D. $y_2(y_1) = \frac{50 - y_1}{3}$

3. The NCE output for country 1 is

A. $\hat{y}_1 = \frac{50}{3}$

B. $\hat{y}_1 = 10$

C. $\hat{y}_1 = \frac{25}{2}$

D. $\hat{y}_1 = 12$

4. The NCE output for country 2 is

A. $\hat{y}_2 = \frac{50}{3}$

B. $\hat{y}_2 = 10$

C. $\hat{y}_2 = \frac{25}{2}$

D. $\hat{y}_2 = 12$

5. The social optimum (where social surplus is maximized) is

A. $y_1^* = y_2^* = \frac{25}{3}$

B. $y_1^* = \frac{17}{3}$ and $y_2^* = \frac{13}{3}$

C. $y_1^* = 9$ and $y_2^* = 8$

D. $y_1^* = y_2^* = 7$

6. The Pigouvian tax rate in this setting is

A. $t^* = \frac{25}{3}$

B. $t^* = 8$

C. $t^* = 9$

D. $t^* = \frac{50}{3}$

7. If country 1 commits to its socially-optimal level of output, the best response for country 2 is

- A. its socially-optimal level of output
- B. its non-cooperative equilibrium level of output
- C. greater than its non-cooperative equilibrium level of output
- D. less than its non-cooperative equilibrium level of output

Questions 8 – 15 relate to the following information.

Consider a transboundary pollution game between two identical countries where the payoff to country 1 is

$$u_1(y_1, y_2) = 100y_1 - 5y_1^2 - 10(y_1 + y_2)y_1$$

and the payoff to country 2 is

$$u_2(y_1, y_2) = 100y_2 - 5y_2^2 - 10(y_1 + y_2)y_2$$

In the context of the game from the lecture notes, in this example, $v = 100$, $\omega = 5$ and $\delta = 10$.

8. The best-response function for country 1 is

- A. $y_1(y_2) = \frac{10 - y_2}{4}$
- B. $y_1(y_2) = \frac{10 - 2y_2}{3}$
- C. $y_1(y_2) = \frac{10 - y_2}{3}$
- D. $y_1(y_2) = \frac{5 - y_2}{3}$

9. The sole-agent optimum for country 2 is

- A. $y_2^0 = \frac{5}{3}$
- B. $y_2^0 = \frac{10}{3}$
- C. $y_2^0 = \frac{10}{4}$
- D. $y_2^0 = \frac{3}{5}$

10. The NCE output for country 1 is

- A. $\hat{y}_1 = \frac{5}{2}$
- B. $\hat{y}_1 = 3$
- C. $\hat{y}_1 = 2$
- D. $\hat{y}_1 = \frac{7}{3}$

11. The social optimum (where social surplus is maximized) is

- A. $y_1^* = y_2^* = \frac{3}{2}$
- B. $y_1^* = \frac{3}{2}$ and $y_2^* = 2$
- C. $y_1^* = 2$ and $y_2^* = \frac{3}{2}$
- D. $y_1^* = y_2^* = 2$

12. The social optimum lies inside the core with respect to the NCE.

- A. True.
- B. False.

13. The Pigouvian tax rate in this setting is

A. $t^* = 12$

B. $t^* = 20$

C. $t^* = 9$

D. $t^* = \frac{8}{3}$

14. If all tax revenue is refunded, aggregate global output in response to the Pigouvian tax is

A. $Y^* = 4$

B. $Y^* = 5$

C. $Y^* = 2$

D. $Y^* = \frac{5}{2}$

15. If country 1 commits to its socially optimal level of emissions, the best response for country 2 is

A. $y_2^R(y_1^*) = \frac{8}{3}$

B. $y_2^R(y_1^*) = 2$

C. $y_2^R(y_1^*) = 3$

D. $y_2^R(y_1^*) = \frac{5}{2}$

ANSWER KEY

1. A
2. C
3. B
4. B
5. A
6. D
7. C
8. C
9. B
10. A
11. D
12. A
13. B
14. A
15. A