

Principles of Economics I (Fall 2011)

Homework #4

(Lecture 9, Due on Nov. 28, 2011, submitted *out of class*)

TAs will score Odd numbers.

Note: All textbook problem numbers refer to “Problems and Application” part in corresponding chapter, the 5th international student edition of the textbook.

For Chapter 10

1. Chapter 10, #6

a. The statement, "The benefits of corrective taxes as a way to reduce pollution have to be weighed against the deadweight losses that these taxes cause," is false. In fact, corrective taxes reduce the inefficiency of pollution by reducing the quantity of the good being produced that has pollution as a by-product. So, corrective taxes reduce deadweight loss; they do not increase it.

b. The statement, "When deciding whether to levy a corrective tax on consumers or producers, the government should be careful to levy the tax on the side of the market generating the externality," is inaccurate. It does not matter on whom the tax is imposed the incidence of the tax will be identical. So whether the externality is caused by the seller or the buyer of a good, a tax on either producers or consumers will lead to the same reduction of quantity and change in the prices producers receive or consumers pay.

2. Chapter 10, #10

a. An improvement in the technology for controlling pollution would reduce the demand for pollution rights, shifting the demand curve to the left. Figure A illustrates what would happen if there were a corrective tax, while Figure B shows the impact if there were a fixed supply of pollution permits. In both figures, the curve labeled D_1 is the original demand for pollution rights and the curve labeled D_2 is the new demand for pollution rights after the improvement in technology.

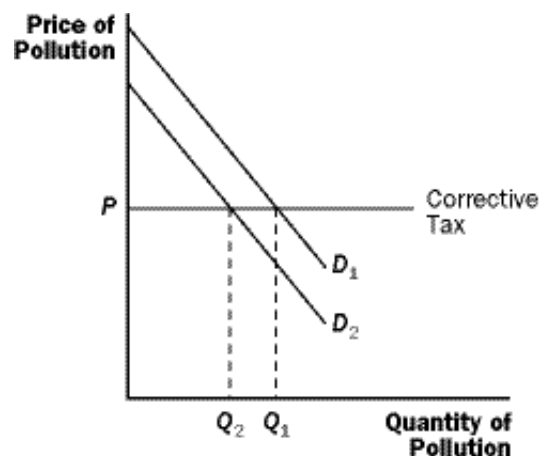


Figure A

b. With a corrective tax, the price of pollution remains unchanged and the quantity of pollution declines, as Figure 6 shows. With pollution permits, the price of pollution declines and the quantity of pollution is unchanged, as Figure 7 illustrates.

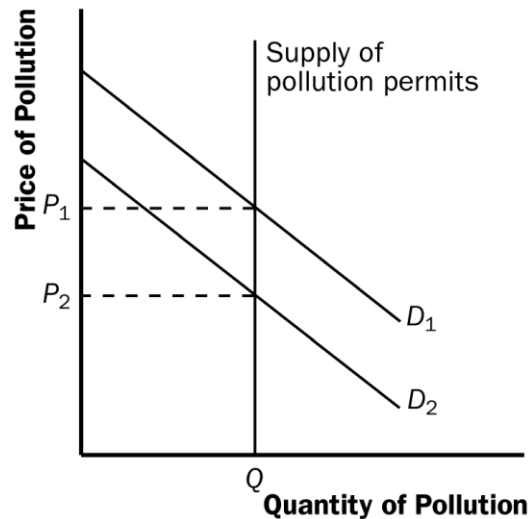


Figure B

3. Chapter 10, #12

a. A permit is worth \$25 to firm B, \$20 to firm A, and \$10 to firm C, because that is the cost of reducing pollution by one unit. Because firm B faces the highest costs of reducing pollution, it will keep its own 40 permits and buy 40 permits from the other firms, so that it can still pollute 80 units. That leaves 40 permits for firms A and C. Because firm A values them most highly, it will keep its own 40 permits. So it must be that firm C sells its 40 permits to firm B. Thus firm B does not reduce its pollution at all, firm A reduces its pollution by 30 units at a cost of $\$20 \times 30 = \600 , and firm C reduces its pollution by 50 units at a cost of $\$10 \times 50 = \500 . The total cost of pollution reduction is \$1,100.

b. If the permits could not be traded, then firm A would have to reduce its pollution by 30 units at a cost of $\$20 \times 30 = \600 , firm B would reduce its pollution by 40 units at a cost of $\$25 \times 40 = \$1,000$, and firm C would reduce its pollution by 10 units at a cost of $\$10 \times 10 = \100 . The total cost of pollution reduction would be \$1,700, \$600 higher than in the case in which the permits could be traded.

4. Chapter 10, #13

a. Figure A shows the market for Negext. The equilibrium price is \$10 and the equilibrium quantity is 50. Consumer surplus is \$250, producer surplus is \$250, and total surplus is \$500.

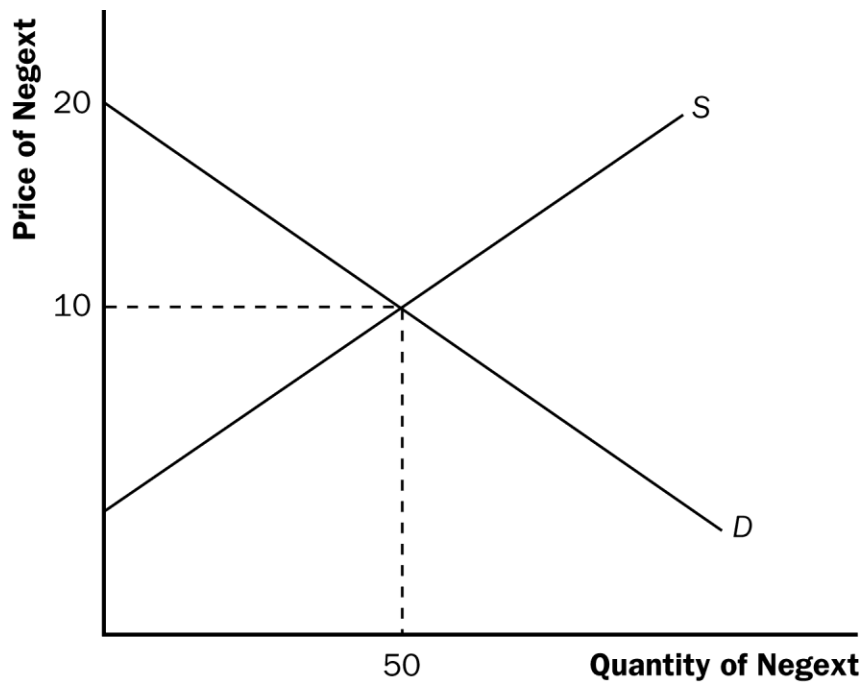


Figure A

b. In equilibrium, 50 units are produced, so the total cost of the pollution is $1 \times 50 \times 4 = \$200$. This reduces total surplus to \$300.

c. Banning Negext would be a bad idea because total surplus would fall to zero.

d. Figure B shows the market for Negext after the limit is put into place. The restriction limits the production to 25 units. The price of Negext rises to \$15. Consumer surplus falls to \$62.50, producer surplus rises to \$312.50, pollution costs are \$100, and total surplus is \$275. No, it is not a good policy because it reduces total surplus.

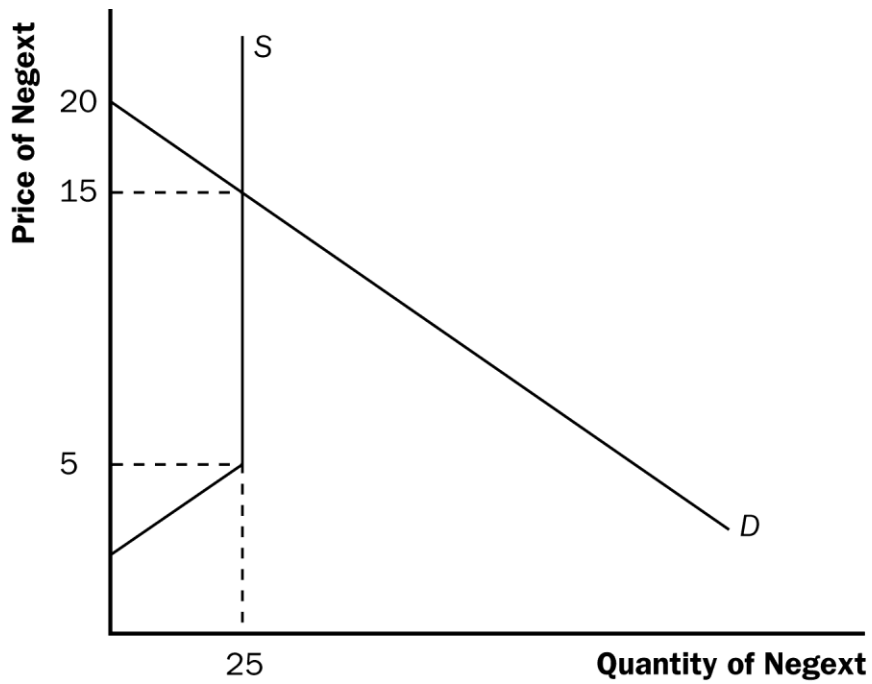


Figure B

e. As Figure 10 shows, the price paid by buyers will rise to \$12, with sellers receiving a price of \$8 after the tax. Forty units will be produced. Tax revenue will be \$160. Consumer surplus is \$160, producer surplus is \$160, and the cost of pollution is \$160. This means that total surplus rises to \$320.

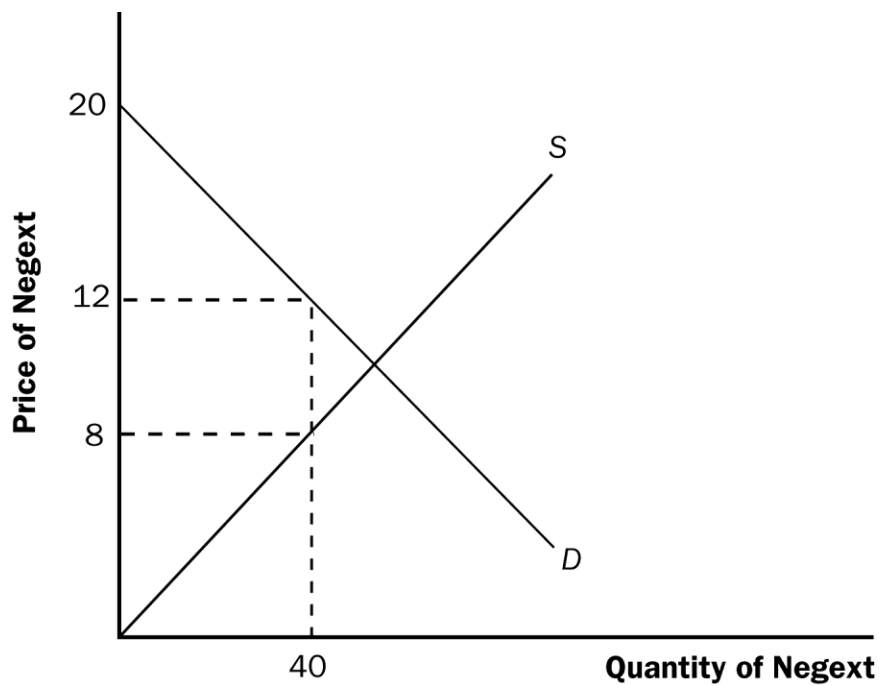


Figure C

f. The higher the external cost, the higher the optimal tax on Negext. If the external cost were \$2.50 per unit of pollution or higher, it would make sense to ban Negext. The total surplus in the market (after accounting for the externality) would be zero or lower.

5. 科斯定理与体育经济学

- (1) 能。共同的好处是： $(1/2) \times (11,600 - 10,000) = 800$ 。
戴尔向艾伦支付转会费“差价”为： $(3,500 + 400) - 2,900 = 1,000$ 。（理由：根据题意，他需要使得艾伦从协议中获得好处最终等于 400，同时注意到协议后艾伦的门票收入等于 $(1/2) \times (1/2) \times 11,600 = 2,900$ 。）
所有队员的赛季收入及其来源如下：
艾伦：3,900，其中：门票收入 2,900，转会费收入 1,000；
艾伯特：2,900，均为门票收入。
戴尔：1,900，其中：门票收入 2,900，转会费支付 1,000；
戴维：2,900，均为门票收入。
- (2) 可以。因为艾伦从协议中得到的收益是 400；而艾伯特从协议中受到的损害是 $3,500 - 2,900 = 600$ ，大于艾伦的收益。具体的，如果艾伯特向艾伦支付 400-600 之间的任意金额，都可以阻止艾伦转会，双方都好于转会后的处境。
- (3) 有。戴尔只要让出部分的协议总收益，使得艾伦从转会中所得大于 600；此时自己仍然可能变好——只要艾伦得到好处小于 800。
- (4) 可以。
只要戴尔与戴维谈判，请戴维支付最小 $1,600 - 800 = 800$ ，最大 2,400（不使戴维受损）的金额。然后戴尔使得艾伦得到的协议好处不少于 1,600（以避免艾伯特的阻挠）；并确保艾伦不会受损（这是可能的）。
- (5) 可以实现。
此时转会给两个队带来的总的好处是 $11,600 - 10,000 = 1,600$ 。则每队得到 800，每名队员得到 400。由此可计算最终收入，得到：艾伦：3,900，艾伯特：3,900；戴尔：1,900；戴维：1,900。
- (6) 同样有效率（但协商转会可能具有更高的交易成本）；后者更加公平（因为他使得水平相当的球员不因是否转会而产生收入差别）。
- (7) “常胜将军”的出现并不是整个联赛收入最大化的选择，而势均力敌的比赛才是。在存在“转会”制度的前提下，根据科斯定理，人们可以通过“转会”这样的科斯谈判，使得总收入最大，这必然导致“势均力敌”的场面。
这种谈判给每个队都带来好处。虽然强队变弱了，但并没有吃亏，因为他们从转会费中得到好处。

For Chapter 11

6. Chapter 11, #2

- a. Within the dorm room, the showing of a movie is a public good. None of the roommates can be excluded from viewing the movie. Because one roommate's viewing does not affect the ability of another roommate to view the movie, the good is also nonrival in consumption.
- b. The roommates should rent three movies because the value of the fourth film (\$6) would be less than the cost (\$8).

- c. The total cost would be $\$8 \times 3 = \24 . If the cost were divided evenly among the roommates, each would pay $\$6$. Orson values three movies at $\$18$ so his surplus would be $\$12$. Alfred values three movies at $\$12$ so his surplus would be $\$6$. Woody values three movies at $\$6$, so his surplus would be $\$0$. Ingmar values three movies at $\$3$ so his surplus is $-\$3$. Total surplus among the three roommates would be $\$15$.
- d. The costs could be divided up by the roommates based on the benefits they receive. Because Orson values the movies the most, he would pay the greatest share. The problem is that this gives each roommate an incentive to understate the value of the movies to him.
- e. Because they are going to pay equal shares, Orson has an incentive to tell the truth about the value he places on movies to ensure that the group rents three movies. He values each of the movies more than his cost per movie ($\$2$).
- f. The optimal provision of public goods will occur if individuals do not have an incentive to hide their valuation of a good. This means that each individual's cost cannot be related to his valuation.

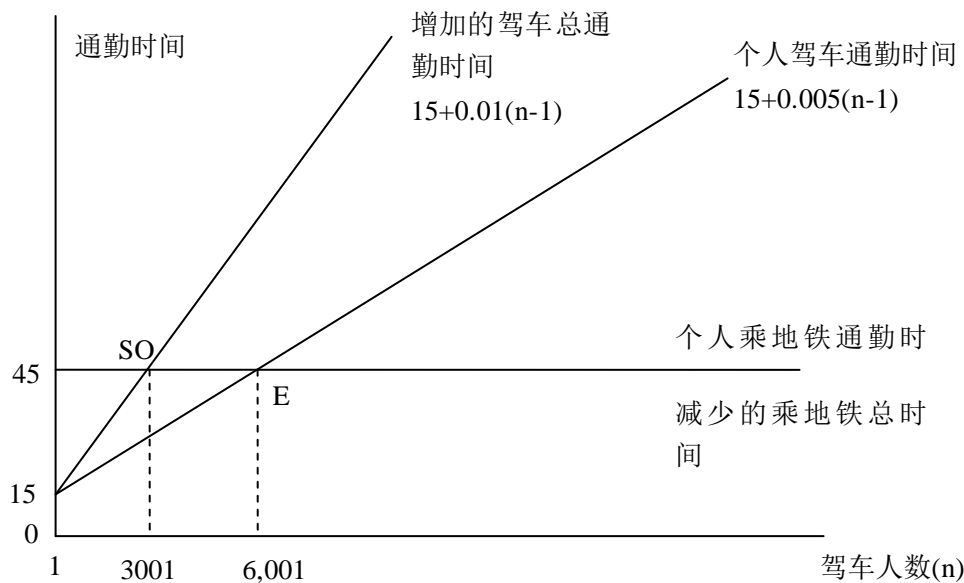
7. 交通经济学与外部性

- (1) 每个驾车人需要花费的时间是 $15+0.005(n-1)=14.995+0.005n$ 。
- (2) 该人选择驾车的通勤时间为: $15+0.005n$; 他选择乘坐地铁的通勤时间为 45。则该人选择驾车当且仅当:

$$15+0.005n \leq 45, \text{ 即: } n \leq 6,000。$$

则最终选择驾车的人为 6,001 人, 乘地铁的人为 1,999 人?

- (3) 如下图。交点 E 对应 $n=6,001$, 通勤时间为 45 分钟, 此时驾车时间与乘地铁相同。交点对应均衡时选择驾车的人数和相应的通勤时间。



(4) 社会总的通勤时间为：

$$(15+0.005(n-1))*n+45*(8,000-n) = 0.005n^2 - 30.005n+360,000 \approx 0.005*(n-6,001/2)^2+315,000。$$

则社会最优的驾车人数为 $6,001/2=3,000.5 \approx 3001$ （答 3000 也算对）。这一数量小于均衡的驾车人数（6001 人）。

(5) 增加一个驾车人后该驾车人的通勤时间为：

$$15+0.005(n-1)。$$

增加一个驾车人增加的所有驾车人的通勤时间为：

$$(15+0.005(n-1))*n-(15+0.005(n-2))*(n-1)=15+0.01(n-1)>15+0.005(n-1)。$$

也就是说，该驾车人自己付出的时间成本小于整个社会为这一行动付出的时间成本（也可以说，他从乘地铁转而驾车的个人节约的时间小于社会为此行动得到的时间节约），该驾车人造成了负外部性。

(6) 如上图。注意到第 2 条曲线和乘地铁通勤时间曲线重合（即为 45 分钟的水平线）。交点处 SO 的 $n=3,001$ ，驾车通勤时间 $15+0.005*(n-1)=30$ 分钟（注意不是交点对应的的时间）。

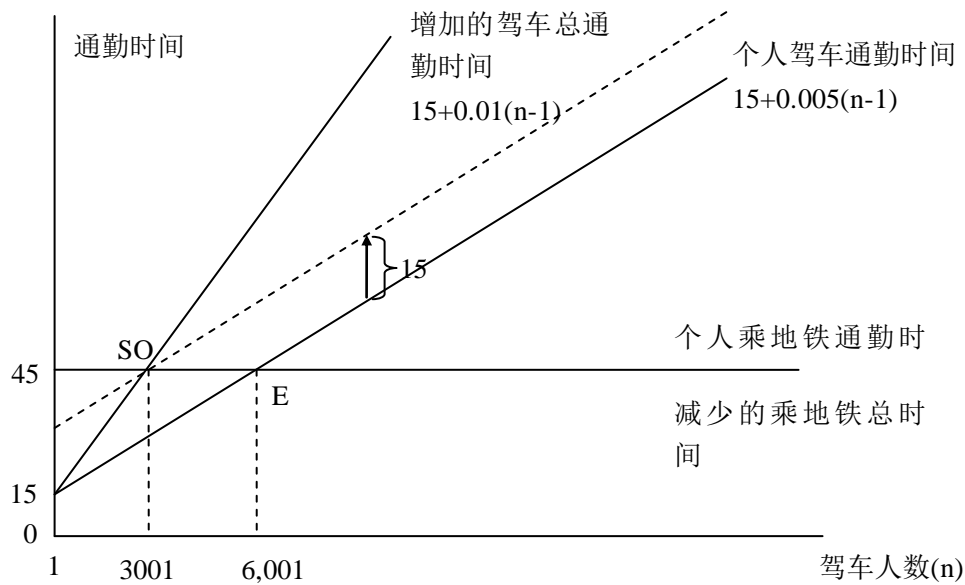
该交点代表社会最优的驾车人数量（与第（4）问仅近似相等是因为单位差分和导数仅近似相等）。直观来说，当驾车人数量为 3,001 时，增加该驾车人带来的社会收益（即减少的乘地铁总时间，45 分钟）等于增加的社会成本（即增加的驾车总时间，也为 45 分钟）。

(7) 道路通行费即为庇古税（或矫正税）。

设该道路通行费为 t 元，则为了使驾车人自动选择最优数量 $n=3001$ ，应使第 3001 个驾车人选择驾车和乘地铁的个人收益相等：

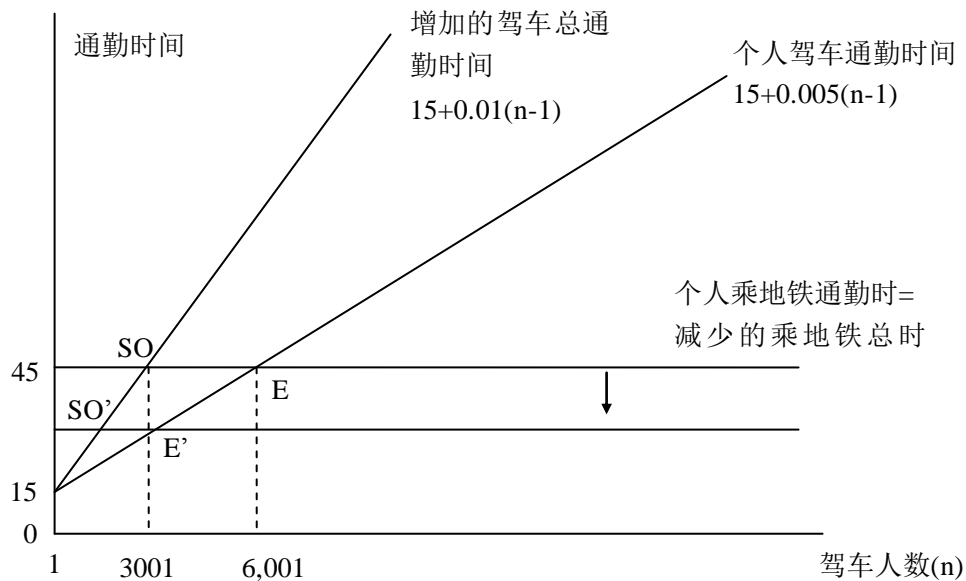
$$15+0.005*(3001-1)+t*1=45，即 t=15 元。$$

图形表示为将个人的驾车通勤时间曲线上移 15 分钟。（如下图）



- (8) 如下图。从缩短了所有人的通勤时间（都等于减少后的地铁通勤时间）上看这一办法解决了交通问题。但从负外部性依然存在（或者说，社会最优的通勤总时间并未实现来看，这一办法并未从根本上解决交通问题，图形上表现为社会最优点 SO' 和均衡点 E' 依然未重合。

政府必须把乘坐地铁时间减少到 15 分钟才能从根本上消除负外部性问题。



- (9) 这个题目的答案是开放的。
应该说最好的政策是二者的结合。通过修建地铁可以减少所有人的通勤时间，但无法消除无效率。而征收道路使用费即可以减少愿意支付该费用的人的通勤时间，又可以消除无效率，但毕竟效果有限，同时，这一方法可能带来不公平。

For Chapter 12

8. Chapter 12, #4

a. If the number of retirees is rising and total expenditures are frozen, then benefits per retiree will decline over time. Because the number of workers is rising, albeit slowly, tax payments per worker would decline slowly over time.

b. If benefits per retiree were frozen, total expenditures would rise quickly, along with the number of retirees. To pay for the increased expenditures, tax payments per worker would rise, because the number of workers isn't growing as rapidly as the number of retirees.

c. If tax payments per worker were frozen, total expenditures would rise slowly, at the same rate as the growth rate of the number of workers. Because the number of retirees is rising more rapidly, benefits per retiree would decline over time.

d. The answers to Parts (a), (b), and (c) suggest there is no easy solution. Either workers will pay more per person or retirees will get fewer benefits per person. Policymakers may eventually be forced to compromise, both reducing benefits per retiree and increasing tax payments per worker.

9. Chapter 12, #9

a. The fact that visitors to many national parks pay an entrance fee is an example of the benefits principle, because people are paying for the benefits they receive.

b. The fact that local property taxes support elementary and secondary schools is an example of the ability-to-pay principle, because if you own more expensive property, you must pay more tax.

c. The setup of airport trust funds is an example of the benefits principle, because use of the airport generates tax revenue that pays for upkeep of the airport.

10. Chapter 12, #10

a. For the proportional tax system, the average tax rate is 25% whether a person earns income of \$50,000, \$100,000, or \$200,000.

For the regressive tax system, the average tax rate is 30% for someone earning \$50,000, 25% for someone earning \$100,000, and 20% for someone earning \$200,000.

For the progressive tax system, the average tax rate is 20% for someone earning \$50,000, 25% for someone earning \$100,000, and 30% for someone earning \$200,000.

b. For the proportional tax system, the marginal tax rate as income rises from \$50,000 to \$100,000 is the increase in taxes (\$12,500) divided by the increase in income (\$50,000) = 25%. The marginal tax rate as income rises from \$100,000 to \$200,000 is the increase in taxes (\$25,000) divided by the increase in income (\$100,000) = 25%.

For the regressive tax system, the marginal tax rate as income rises from \$50,000 to \$100,000 is the increase in taxes (\$10,000) divided by the increase in income (\$50,000) = 20%. The marginal

tax rate as income rises from \$100,000 to \$200,000 is the increase in taxes (\$15,000) divided by the increase in income (\$100,000) = 15%.

For the progressive tax system, the marginal tax rate as income rises from \$50,000 to \$100,000 is the increase in taxes (\$15,000) divided by the increase in income (\$50,000) = 30%. The marginal tax rate as income rises from \$100,000 to \$200,000 is the increase in taxes (\$35,000) divided by the increase in income (\$100,000) = 35%.

c. In the proportional tax system, the average tax rate equals the marginal tax rate. In the regressive tax system, the marginal tax rate is less than the average tax rate and both tax rates decline as income rises. In the progressive tax system, the marginal tax rate is greater than the average tax rate and both tax rates rise as income rises. The marginal tax rate is relevant to someone deciding whether to accept a job that pays slightly more than her current job, because it tells her how much of the extra income she will be able to keep after taxes. For judging the vertical equity of the tax system, the average tax rate is relevant, because vertical equity suggests that people with a greater ability to pay should pay a larger amount.

11. B.

12. A.