Public Economics (ECON 131)
Section #10: Public goods

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1 Key Concepts

- A pure **public good** is a good that satisfies the following two conditions:
  - Non-rivalry: The consumption of the good by one individual doesn't affect other's opportunity to consume the good.
  - Non-excludability: Individuals cannot be excluded from consuming the good.
- The **Social Demand Curve** is the aggregated demand for a good and can be found by summing the individual demand curves *vertically* for public goods (as opposed to horizontally for private goods). '
- **Samuelson Rule**: Since a public good can simultaneously benefit many individuals, the optimal provision of a public good is achieved when the marginal cost of provision is set equal to the sum of the individuals' marginal rate of substitutions for the good.
- The inability to exclude people from enjoying a public good creates the incentive for individuals to consume it without paying, ie **free riding**. This results in the underprovision of public goods in the private market.

2 Practice Problems

2.1 Gruber, Ch.7, Q.13

The town of Springfield has two residents: Homer and Bart. The town currently funds its fire department solely from the individual contributions of these residents. Each of the two residents has a utility function over private goods (X_i) and total firefighters (M) of the form $U_i = 4 \cdot log(X_i) + 2 \cdot log(M)$, where $i = B, H$. The total provision of firefighters hired, M, is the sum of the number hired by each of the two persons: $M = M_H + M_B$. Homer and Bart both have income of \$100, and the price of both the private good and a firefighter is \$1.

(a) How many firefighters are hired if the government does not intervene? How many are paid for by Homer? By Bart?

(b) What is the socially optimal number of firefighters? If your answer differs from part (a), why?

2.2 Gruber, Ch.7, Q.15

Consider an economy with three types of individuals, differing only with respect to their preferences for monuments. Individuals of the first type get a fixed benefit of 100 from the mere existence of monuments, whatever their number. Individuals of the second and third type get benefits according to $B_{II} = 200 + 30M - 1.5M^2$ and $B_{III} = 150 + 90M - 4.5M^2$, where M denotes the number of monuments in the city. Assume that there are 50 people of each type. Monuments cost \$3,600 each to build. How many monuments should be built?

2.3 Gruber, Ch.7, Q.12

Andrew, Beth, and Cathy live in Lindhville. Andrew's demand for bike paths, a public good, is given by $Q = 12-2P$. Beth's demand is $Q = 18-P$, and Cathy's is $Q = 8-P/3$. The marginal cost of building a bike path is $MC = 21$. The town government decides to use the following procedure for deciding how many paths to build. It asks each resident how many paths they want, and it builds the largest number asked for by any resident. To pay for these paths, it then taxes Andrew, Beth, and Cathy the prices a, b, and c per path, respectively, where $a+b+c = MC$. (The residents know these tax rates before stating how many paths they want.)

(a) If the taxes are set so that each resident shares the cost evenly ($a = b = c$), how many paths will get built?

(b) Show that the government can achieve the social optimum by setting the correct tax prices a, b, and c. What prices should it set?