

Problem Set 5: Review, Public Goods, and Economic Growth

1) **Public Goods:** Suppose that weather forecast systems require funding in billion-dollar chunks, and that each billion dollars invested in weather forecasting doubles your odds of getting the forecast right—that if you spend nothing your forecast, pure chance, has only a 50% chance of being right; that if you spend \$1B your forecast has a 75% chance of being right, that if if you spend \$2B your forecast has a 87.5% chance of being right, and so forth.

a) Suppose that for an average person the cost of getting the weather forecast consistently wrong over the life of the system is \$100. If there are a million people in the area, how much should the government spend on weather forecasting?

b) Suppose that for an average person the cost of getting the weather forecast consistently wrong over the life of the system is \$1000. If there are five million people in the area, how much should the government spend on weather forecasting?

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c) Suppose that someone decided it would be a good idea to privatize the weather forecasting system—to have a private company broadcast the forecast over media and internet, and collect money by subjecting people to annoying ads while they listen to the forecast. Would this be sustainable equilibrium or not?

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2) **Review: Minimum Wages:** In lecture we set down rough numbers for California's forthcoming ongoing choice to raise the minimum wage to \$15/hour in 2023—to a level that represents an increase from a level in 2014 that, relative to productivity and given current inflation, would correspond to \$10.50/hour. Suppose that in 2023 there will be 4 million low-wage workers in California affected by this policy.

a) If the demand curve for low-wage workers in 2015 is:

$$P = 10.50 - 20(Q - 4)$$

and the supply curve is:

$$P = 8,$$

what will be the shift in price and quantity from the equilibrium $(P, Q) = (10.50, 4)$ to the new price-floor equilibrium as a result of this policy? What will be the change in consumer and producer surplus?

b) In what units are your answers to (a). If you wanted to express them in terms of dollars per year, how would you go about doing that and what would your answers be?

c) How would you go about thinking whether this minimum wage increase was a good policy or not?

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d) If, instead, the demand curve for low-wage workers in 2015 is:

$$P = 10.50 - 20(Q - 4)$$

and the supply curve is:

$Q = 4$ (i.e., the opportunity cost of a low-wage worker is zero up to the point where 4 million are employed, and there are no additional low-wage workers available at higher wages)

what will be the shift in price and quantity from the equilibrium $(P, Q) = (10.50, 4)$ to the new price-floor equilibrium as a result of this policy? What will be the change in consumer and producer surplus?

e) In what units are your answers to (a). If you wanted to express them in terms of dollars per year, how would you go about doing that and what would your answers be?

f) How would you go about thinking whether this minimum wage increase was a good policy or not?

3) **Economic Growth:** Consider once again our very long-run global economic real GDP growth and prosperity table from lecture:

In the Shadow of Malthus

Year	Population (Millions)	GDP per Capita (\$2015)	Total World GDP (\$2015 Billions)
-8000	5	\$750	\$4
-1000	50	\$750	\$38
0	170	\$750	\$128
1500	500	\$750	\$375
1800	750	\$1000	\$750
1900	1500	\$2000	\$3000
2000	6200	\$7700	\$47740
2015	7400	\$10000	\$74000

Assume that, going forward, world population peaks at 10 billion people in 2050 and then stabilizes. Assume that growth in world real GDP continues at its current 21st century pace.

a) The global well-off today—the top 10%—receive about 40% of global GDP as income. What is the average income of the global well-off? In what year will the average person on the globe be as well off as the typical member of the global well-off today?

b) The global rich today—the top 1%—receive about 15% of global GDP as income. What is the average income of the global rich? In what year will the average person on the globe be as well off as the typical member of the global rich today?

c) The global super-rich today—the top 0.01%, the top 740,000—receive about 3% of global income. What is the average income of the global super-rich? In what year will the average person on the globe be as well off as the typical member of the global super-rich today?

d) The global plutocracy today—the top 0.0001%, the top 7,400—receive about 1% of global income. What is the average income of the global plutocracy? In what year will the average person on the globe be as well off as the typical member of the global plutocracy today?