Economics 301
Sample Problem Set No Submission Required

1) Here we consider the opportunity costs of closing schools for a year during a pandemic. We assume that no net learning occurs during that year: students end the year with the same human capital they had at the beginning.

To systematically analyze this issue, we treat schooling as a production process with many inputs. The inputs are especially effort and attention by students, teachers, and parents, at various ages. The ultimate output is human capital that enhances earnings and household production during the students' adult lives, the present value of which is in the millions of dollars per person.

a) Do you expect children to "make up for" the lost schooling after the pandemic ends? That is, would the pandemic reduce long-run human capital, or just perturb its time path during and near the pandemic? What factors of tastes and technology determine the answer?

b) To the extent that persons of schooling age during the pandemic later enter adulthood with x less human capital than they would have had, how would you value that increment to human capital?

c) How does the value of the x increment to human capital relate to the opportunity cost of closing schools during a nonpandemic year? How does it relate to the opportunity cost of closing schools during the pandemic?

d) How could you estimate the value of the x increment using data on the amount of market inputs (such as teacher salaries) and student time that normally goes into schooling?

e) Suppose that remote learning (the mode used while schools are closed) reduces the productivity of student and teacher time and effort in terms of producing learning. Use Marshall's laws of derived demand to discuss the effect of closed schools on student and teacher time and effort. Is this assumption about remote learning consistent with our earlier assumption that no net learning occurred during the year?

2) An inventor creates a new product, manufactured with a linear technology, anticipating that for one period he will be the only one knowing how to produce it. Each consumer of the product during that period is able to also reverse engineer it and produce $n \geq 1$ units in the second period with no obligation toward the inventor. After the second period, the product is neither produced nor consumed. The market demand for the product's services is stable over time, with inverse denoted $v(c_t)$ where c_t is aggregate consumption in period t.

a) What will the equilibrium purchase price of the product in each period?

b) Is the inventor harmed by a larger value for n? Would your answer be different if the product were also produced in a third period, fourth period, etc., with the same copying technology (n)?

c) Are consumers harmed by a larger value for n?

d) Suppose instead that consumers cannot reverse engineer the product, but that employees engaged in production can obtain that knowledge. In the second period, any former employee can start his own production operation with capacity n, with no obligation toward their former employer. What would be the equilibrium purchase price of the product in each period?

e) Would the inventor want to hire employees under "non-compete" clauses that prohibit them from producing or selling the product after they leave the inventor's employment?

f) What factors would determine whether the inventor hires employees with noncompete or with agreements to license production in the future?

g) How would a legal prohibition of non-compete clauses affect wages paid by the inventor? The number of employees he hires?