Causality in Education

Problem 1

(a) Enrollment in charter schools is often dependent on parental involvement, and higher parental involvement may indicate higher student achievement on principle. Intrinsic student motivation may be different on the basis of their choice to enroll in the public charter school compared to the public school, as well as resources being different between students that choose to attend the public charter school versus the public school. This means that it is likely that the sign of the selection bias is positive — student achievement is correlated with willingness to enroll in the charter school.

In the potential outcomes framework, we let S_i denote charter vs. public, we let Z denote resources, and we let P denote parental involvement.

$$\text{Score}_i = \alpha_i + \beta_1 \text{School Effect}_i + \beta_2 \text{Parental Involvement}_i + \beta_3 \text{Resources}_i + \varepsilon$$

$$\text{OE} = E(Y_{1i}|S_i = 1, Z, P) - E(Y_{0i}|S_i = 1, Z, P) + \underbrace{E(Y_{0i}|S_i = 1, Z, P) - E(Y_{0i}|S_i = 0, Z, P)}_{\text{selection bias}}$$

(b) The size of student loans is correlated with the amount of time spent in education (to an extent), meaning that people who had the capability to work through their education and accrued student loans in the process would also be more likely to be able to manage said student loans once they graduated.

(c) Students at more selective colleges might be able to command other resources such as connections outside the classroom as opposed to pure effect from the quality of education at the college.

(d) Economics majors might be a more affluent cohort than philosophy majors due to holding higher information as to the viability of their major's wage prospects, as well as philosophy majors potentially being willing to take the compensating differential of satisfaction of knowledge over their post-college salary.

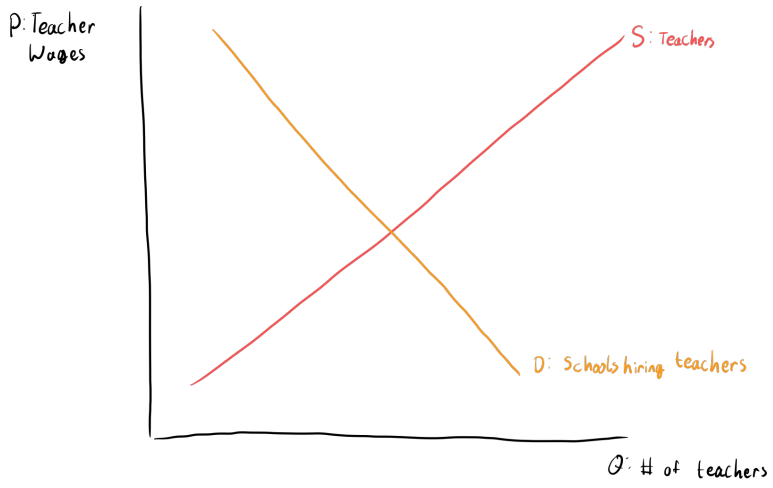
Problem 2

Randomized controlled trials overcome selection bias by removing the ability for participants to select into the treatment or control. However, there are a number of issues with randomized controlled trials:

- feasibility: certain experiments are simply impossible to undertake;
- ethics: many RCTs have large ethical issues associated with them (including denying agency to those who are subject to them);
- external validity: the extent of controls may mean the treatment is not able to be applied to situations not in the experiment.

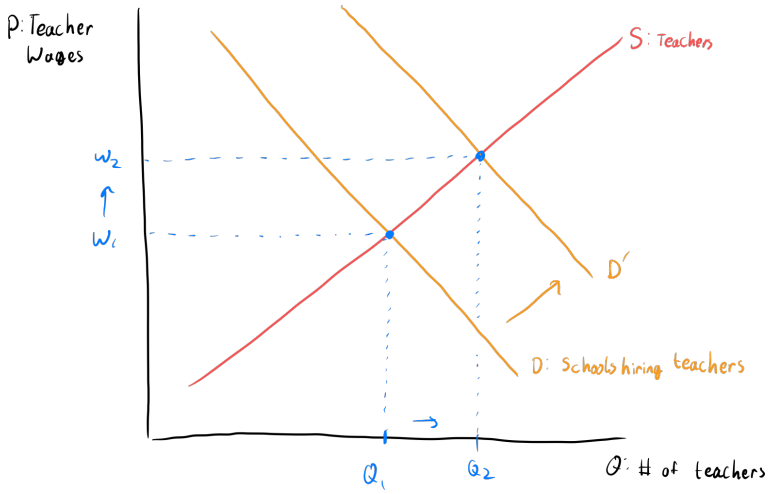
Problem 3

(a) We view Q as the quantity of teachers in secondary education and P as the wage teachers command.

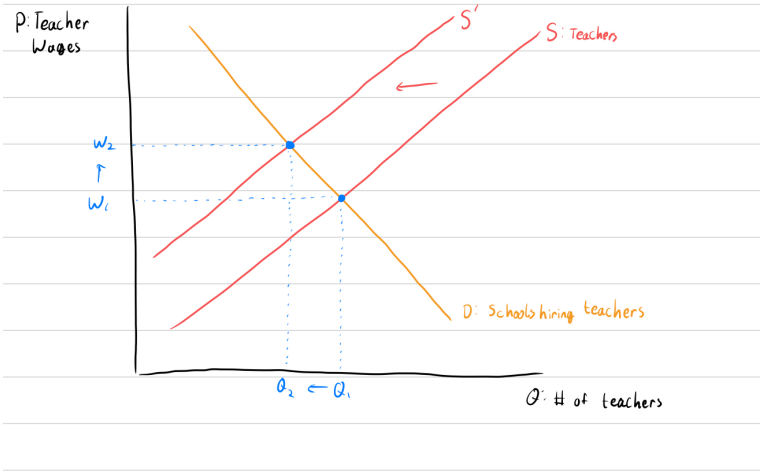


(b) The intersection of supply and demand represent the equilibrium wage of teachers.

(c) If more schools are built we would expect the demand for teachers to increase, leading to an increase in wages and hiring.



(d) Due to the higher wage premium in outside industries, educated workers demand higher wages to enter the teacher labor market, and thus supply of teachers reduces.



Problem 4

(a) It is likely that education spills over into lower crime rates — there is evidence that educating felons reduces recidivism, implying that the effects of education in increasing job access and other factors is meaningful in reducing crime rates.

(b) It is unlikely that education spills over into civic engagement — civic engagement can inform education funding, but it is hard to conceptualize a channel through which education could spill into greater civic engagement.

(c) It is possible that education spills over into culture — cultural changes often originate in the education system, and are transmitted to the entirety of society through educating its populace. However, at the same time, it is possible that culture informs education (as opposed to the other way around).

(d) It is very unlikely that education spills over into air quality, as air quality is often due to environmental and industrial factors that exist independent of education levels.

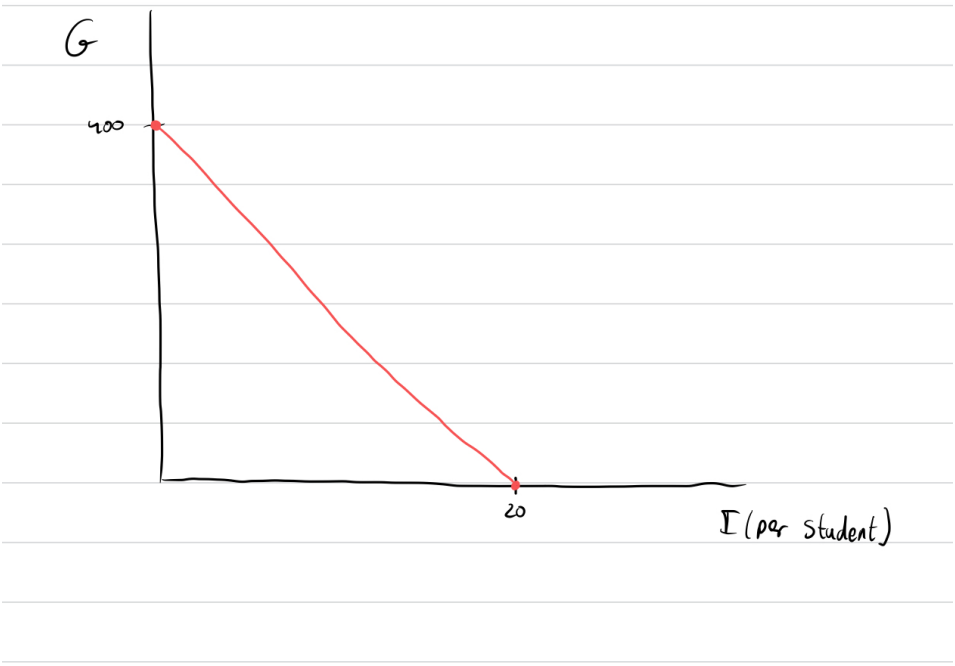
Education Production

Problem 5

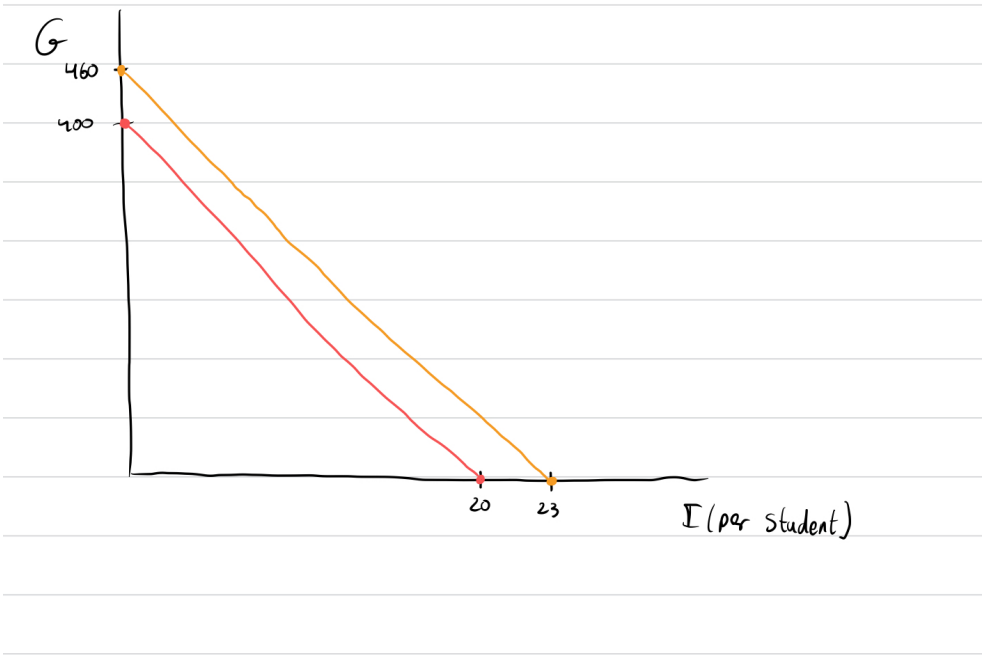
Some "easy to measure" inputs to the education production function are student funding and instructional hours, while some "hard to measure" inputs are student talent and parental effort. Easy-to-measure outputs of the education production function include

graduation rates and standardized test scores, while hard-to-measure outputs include teacher value-added (in terms of income growth) and subject proficiency.

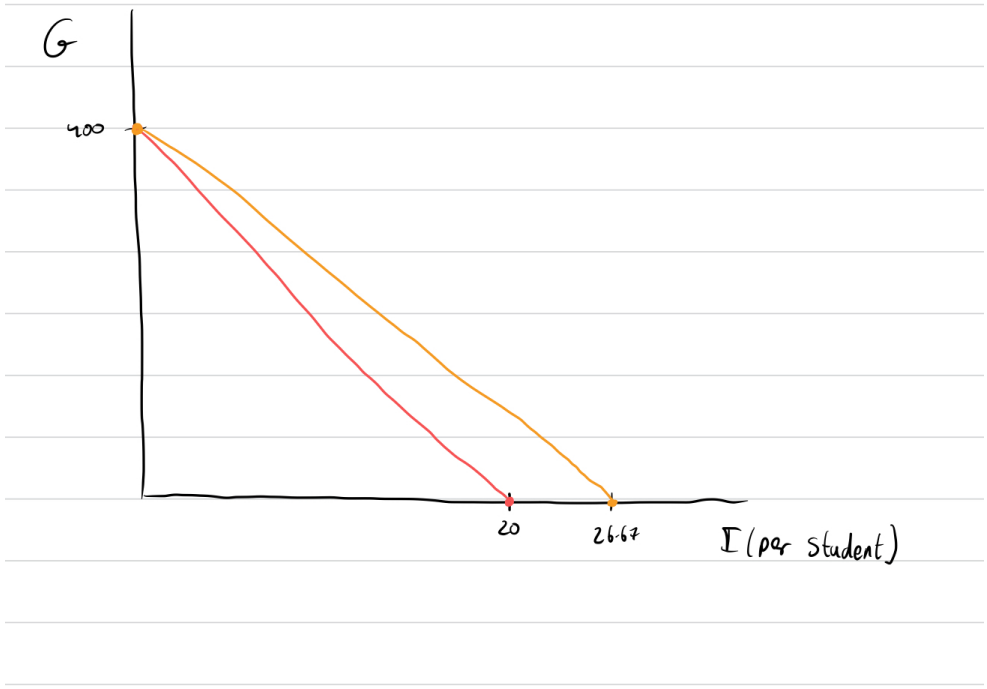
Problem 6



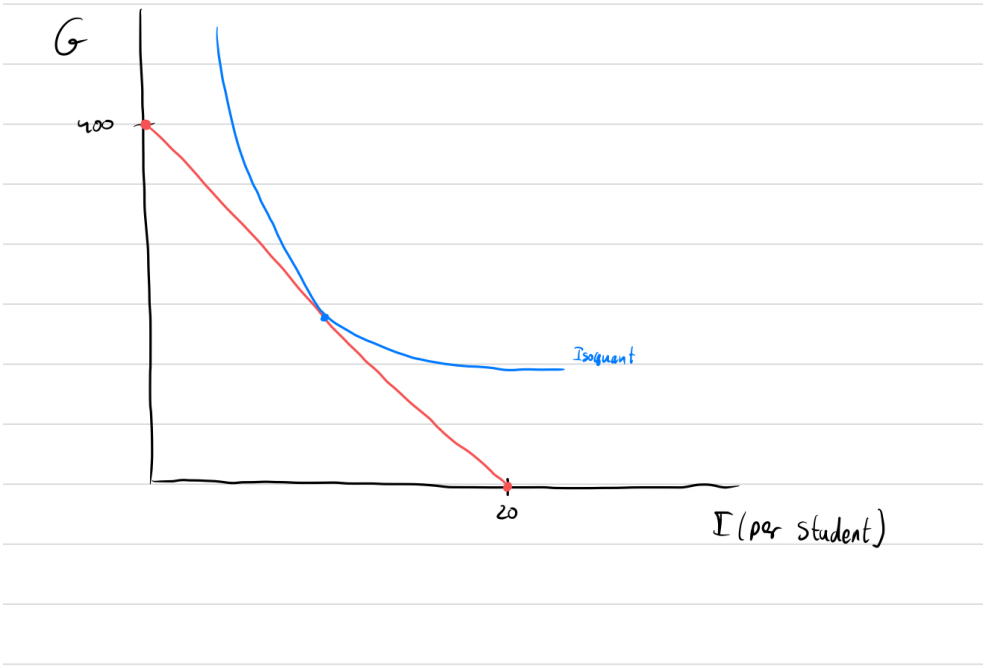
(a)



(b)



(c)



(d) (i)

(ii) The teacher uses individual work until the marginal cost to individual work equals the relative time cost between individual and group work.

Problem 7

(a) For Fremont Unified, the NCES ID is 0614400 with 44 total schools, total enrollment of 33,107, and a student–teacher ratio of 23.58.

(b) (i) 6% of funding is from federal sources, 41% from local sources, and 53% from state sources.

(ii) The school district spends $11,623 per student.

(c) Scarsdale Union Free School District (NCES ID 3625950) has 7 schools, total enrollment of 4,704, and a student–teacher ratio of 11.32. The district receives 0.6% of its revenues from the federal government, 93% from local sources, and 5.7% of its revenues from the state. The district spends $32,002 per student.

(d) Scarsdale more closely models the Tiebout model — high local expenditures in an exclusive location that effectively mirror education as a private good, rather than a large city-level school district with tens of thousands of students.

(e) Tiebout-style funding can exacerbate segregation and engender inefficiencies in important markets such as housing and labor by using the power of the state to zone away housing in places where it is in highest demand.

(f) Tiebout-style funding can increase public school expenditures and closely mirror private education funding, allowing students who would not have been able to afford private school to attend well-funded public schools.