

SOLUTIONS

1. First define your terms: PPIC & NPV.

There's a related term, PI (Pareto Improvement).
a PI occurs with a change in allocation of goods, services which makes everyone better off without making anyone worse off. ~~This~~ How could this be? Well, if there is a reduction in waste, in inefficiency. This is a weak ethical principle which focuses on efficiency gains, so long as no-one loses.

But in general there will be losers - think of the third runway at Sydney Airport - those who live underneath the new flight paths.

So the Potential Pareto Improvement Criterion PPIC focuses on the whole pie: do the gains to winners exceed the losses to the losers? Does $\Sigma \text{gains} > \Sigma \text{losses}$?

If so, then (a) the economic pie is bigger, and (b) the winners could in principle compensate the losers, and still come out ahead.

NPV is the Net Present Value of Benefits less Costs. Which Gains and Losses are ~~to~~ included depends on the type of analysis.
Financial Appraisal - only the benefits or losses costs internal to the organisation.
CBA - the benefits and costs to society: beyond the bottom line!

(False) So, in a CBA, the NPV must be positive for the PPIC to be satisfied: if $NPV < 0$ in a CBA, then the pie is shrinking, and so $\Sigma \text{gains} < \Sigma \text{losses}$ so that compensation cannot take place.

(True) If the NPV is from a F.A., then it might be possible to have an $NPV < 0$ while also satisfying the PPIC. How? Well, if the social costs (using opportunity-cost shadow prices) are less than the financial costs (using market prices), and/or social benefits (spillovers etc.) are greater than financial benefits, then it's possible.

2. The average shadow wage of the 110 skilled workers will depend on the opportunity costs of the two groups of workers, suitably weighted.

It must be the case that, to have hired 90 from similar skilled jobs, the market wage must have risen from w_{sk} to $\$1000/\text{week}$. This means that their previous employers bear a cost = $90 \times (\$1000 + w_{sk})/2$

This is the opportunity cost of the 90, and is the gross-of-tax (or tax-inclusive) cost to their previous employers.

As for the 20 who gratefully leave casual employment, the "gratefully" tells us they were involuntarily

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employed at these casual jobs. We would need to know the w_c , the average casual wage, and the tax rate τ paid by these 20 workers, because their opportunity cost

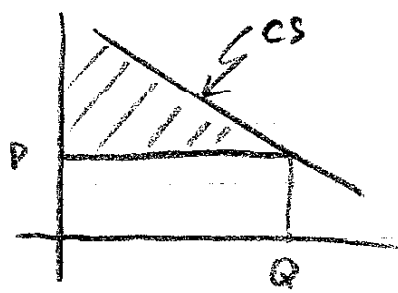
$$= 20 \times w_c (1 - \tau) \ll \$1000 \times 20$$

So the shadow wage for the ~~100~~ 110 would be

$$\frac{9}{11} \times \frac{(w_{sk} + 1000)}{2} + \frac{2}{11} \times w_c \times (1 - \tau)$$

Need to know averages of w_{sk} , w_c , and τ the previous skilled wage, the casual wage, and the tax rate (income).

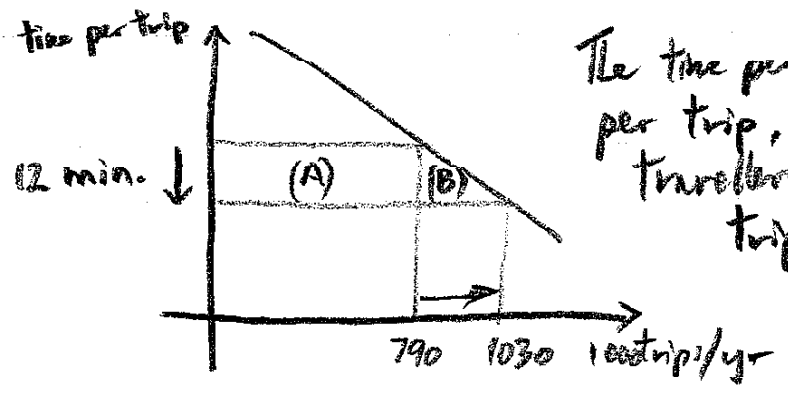
4. (a)



Diagrams help!
(Standard definition of CS)

- (b) Although the highways are not tollways, there is a cost of using them. There are three:
- (1) the time per trip
 - (2) the risk of death per trip
 - (3) the risk of injury per trip.

We return to the second and third in part (c).



The time per trip falls by $\frac{12}{60} = \frac{1}{5}$ hr per trip, which benefits existing travelers (A) and generates new trips (B). So the annual value of the improvement

is given by area $\{(A) + (B)\}$ times 1.3 times the value of time in dollars/hr.

$$\Delta CS = \frac{1}{5} \times 1.75 \times 1.3 \times \frac{1030 + 790}{2}$$

$$= \$414,050/\text{year}.$$

- (Mistakes: - confusing minutes with hours !!
 - plotting the area OK, but not remembering how to calculate the area !!!
 - forgetting that there is a time elasticity of demand: the triangle $\Delta (B)$
 - ignoring the benefits to the existing travellers: area(A) .)

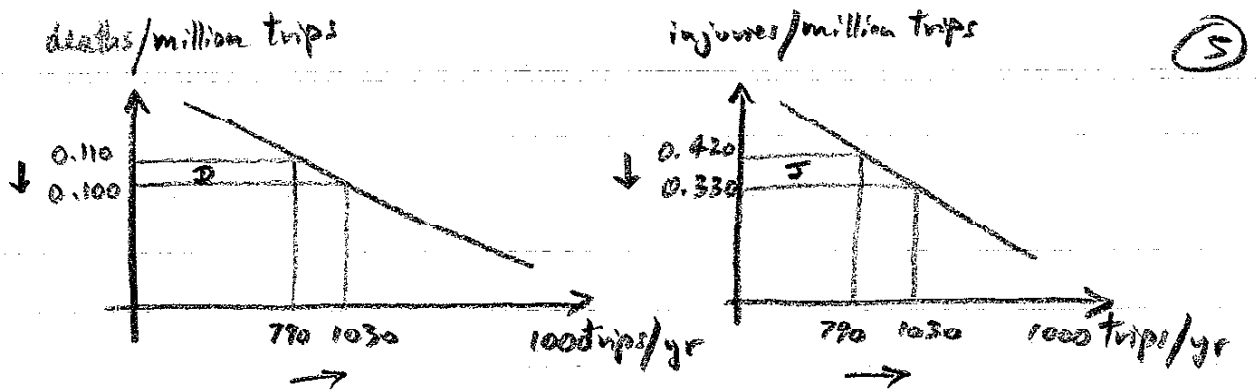
(c) The risk of death or injury to car users is not a P.E.E. It is a direct cost, but there is no clear value - need to decide how to evaluate these risks, and those to pedestrians, as well.

Need to calculate the risk of death or injury per trip to car users. Remember: the car travellers are sensitive to internal, variable costs.

	No imp.	Road imp.
Death/trip	0.110	0.100
Injuries/trip.	0.420	0.330

(figures: per million trips)

So the variable costs per trip have fallen for car users: there is lower risk per trip, but more trips \therefore greater risk per year.



For the car users, we must evaluate the cost of a death or injury, on average, and calculate the gain in £s as a consequence of the road improvement, as above.

For pedestrians, we can calculate the increase in risk of death, and the reduction in risk of injury, using similar values.

Overall, the benefit of the improvements will grow when the risks of death and injury are included, but for the slight increase in risk of pedestrian death.

$$\begin{aligned}
 \text{Note: area D} &= 0.01 \times \frac{790 + 1030}{2} \times 10^{-3} \text{ deaths/yr} \\
 &= 9.1 \times 10^{-3} \text{ deaths/year better off.} \\
 \text{area J} &= 0.09 \times \frac{790 + 1030}{2} \times 10^{-3} \text{ injuries/year} \\
 &= 81.9 \times 10^{-3} \text{ injuries/year better off}
 \end{aligned}$$

(These are for car users.)

3. (a) We need to get the social costs associated with driving time and displacing residents from the area because of the airport.

What value do people place on their travel (driving) time? How many trips/year? How many people/trip? Will the extra 36 min per trip dissuade some people?

Different ways to estimate the value people put on their travel time.

The cost to the displaced residents (measured by their WTP or WTA, perhaps by the cost of land at market rates here and there).

Distinguish between the values (costs) and how to measure them.

(b) Straight forward - and helps you to realize what should be in (a), such as # of trips/year, or # people/car.

(c) The bank will perform a Financial Appraisal, probably using NPV. (Remember, use NPV in CBA as well.)

Needs to know the private benefits and costs. Those actually received or paid by the airport owners.

Remember, the benefits are measured by the revenues accruing, which is a function of the demand for the airport's services, which might be affected by the travel time.