Compensating Variation

1 Introduction

A. Relevant Topics
1) OSHA
2) EPA
3) Company location
4) Affirmative action
B. Job characteristics
1) Fringe benefits
2) Working conditions
3) Safety
4) Absenteeism
C. Verbal example: wage vs risk of death
D. Discussion of parental leave, mandatory advance notice, etc.

2 Analysis

A. Assumptions
1) Utility maximization (not income maximization)
2) Worker information
3) Worker mobility
B. Graphical analysis: See Figures 1 and 2
1) What if we restrict risk to be less than or equal to A?
2) What if individuals become less risk averse?
3) What if workers don’t know the real risk?
4) What if workers are not mobile?
5) Discussion about govt action vs. information dissemination.
6) Discuss public goods aspects
   a) Family
   b) Medical cost sharing

3 Compensating Variation with Full Insurance

Let $U$ be a utility function with $U' > 0$ and $U'' < 0$. Let $w$ be the wage, $k$ the proportion of wage lost if an accident occurs ($0 < k < 1$), $p$ be the probability of an accident, and $I$ be the amount of insurance purchased. Note that, in order for insurance companies to make zero profits, premiums $a$ must satisfy

$$(1 - p) aI - pI = 0 $$

$\Rightarrow a = \frac{p}{(1 - p)}$$
Then expected utility is

\[ E = (1 - p) U \left[ w(p) - \frac{p}{1-p} I \right] + p U \left[ (1 - k) w(p) + I \right]. \]

The optimal amount of insurance can be found by taking a first order condition:

\[ \frac{\partial E}{\partial I} = - \frac{p}{1-p} (1-p) U' \left[ w(p) - \frac{p}{1-p} I \right] + p U' \left[ (1 - k) w(p) + I \right] = 0 \]

\[ \Rightarrow U' \left[ w(p) - \frac{p}{1-p} I \right] = U' \left[ (1 - k) w(p) + I \right] \]

\[ \Rightarrow w(p) - \frac{p}{1-p} I = (1 - k) w(p) + I \]

\[ \Rightarrow (1 - p) k w(p) = I. \]

Note: think about what it means for

\[ U' \left[ w(p) - \frac{p}{1-p} I \right] = U' \left[ (1 - k) w(p) + I \right]. \]

Given our solution for \( I \),

\[ E = (1 - p) U \left[ w(p) - \frac{p}{1-p} (1-p) k w(p) \right] + p U \left[ (1 - k) w(p) + (1 - p) k w(p) \right] \]

\[ = (1 - p) U \left[ (1 - kp) w(p) \right] + p U \left[ (1 - kp) w(p) \right] \]

\[ = U \left[ (1 - kp) w(p) \right]. \]

What is the tradeoff between \( w \) and \( p \) for the worker?

\[ \frac{dw}{dp} = - \frac{\partial E/\partial p}{\partial E/\partial w} = \frac{kw}{1-kp} \]

\[ \Rightarrow \frac{dw}{w} = \frac{kdp}{1-kp} \]

\[ \Rightarrow \ln w = - \ln (1 - kp) + \ln C \]

\[ \Rightarrow w = \frac{C}{1-kp}. \]