Chapter 6

Compensating Wage Differentials

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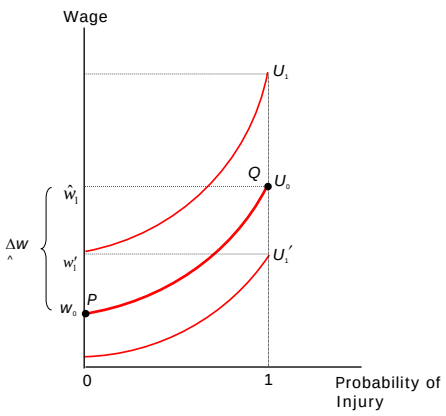
Introduction

- The labour market is not characterised by a single wage: Workers differ and jobs differ.
- Adam Smith proposed the idea that job characteristics influence labour market equilibrium.
- **Compensating wage differentials** arise to compensate workers for nonwage characteristics of the job (i.e. how 'pleasant' or 'unpleasant' a job is).
  - If a job is unpleasant, the firm must probably offer a higher wage to attract workers and vice versa.
- Workers have different preferences and firms have different working conditions.

6.1 The Market for Risky Jobs

- Simple model: Assume only two types of jobs in the labour market (safe jobs versus risky jobs).
  - Safe jobs have probability of zero that worker gets injured. Risky jobs have probability of 1! Workers know this.
- Workers care about whether their jobs are safe or risky.
- A worker's utility function: **Utility = f (w, risk of injury)**
- Indifference curves reveal the trade-offs that a worker prefers between wages and degree of risk (risk assumed to be a 'bad'): **To provide the same utility, risky jobs must pay higher wages than safe jobs.**

Figure 6.1: Indifference Curves Relating the Wage and the Probability of Injury on Job



The worker earns a wage of w_0 dollars and gets U_0 utils if she chooses the safe job. She would prefer the safe job if the risky job paid a wage of w'_1 dollars, but would prefer the risky job if that job paid a wage of w''_1 dollars. The worker is indifferent between the two jobs if the risky job pays $w^\wedge_1$. The worker's **reservation price** is then given by $\Delta w^\wedge = w^\wedge_1 - w_0$.

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Indifference Curves Relating the Wage and the Probability of Injury on Job ctd.

- The greater the worker's dislike for risk, the greater the bribe required for switching from a safe to a risky job, and the greater the reservation price (case of step indifference curves).
- Firms have to choose which type of job to offer. Which is more profitable?
  - Firms may have a risky work environment because it is less expensive to pay higher wages than to make the environment safe.
  - As the wage firms have to offer for risky jobs increases, fewer firms will offer risky jobs (resulting in a downward sloping demand curve for such jobs, see Figure 6.2).
    - Reason: It becomes more profitable for firms to make jobs save than to pay the higher wage.

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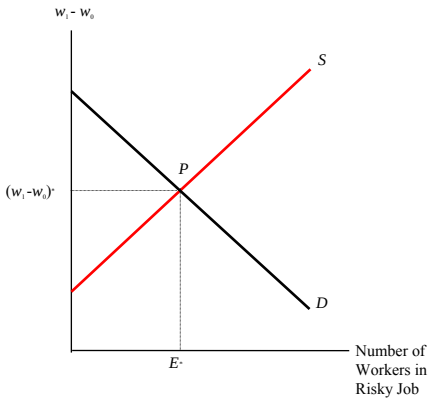
Figure 6.2: Determining the Market Compensating Differential



The supply curve slopes up because as the wage gap between the risky job and the safe job increases, more and more workers are willing to work in the risky job.

The market compensation differential equates supply and demand, and gives the bribe required to attract the last worker hired by risky firms.

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Determining the Market Compensating Differential ctd.

- Note the features of the equilibrium in Figure 6.2:

1. The wage differential is positive. Risky jobs pay more than save jobs.
2. The equilibrium wage differential is that of the last worker hired (the marginal worker). It is not a measure of the average dislike for risk among workers in the labour market.
3. Therefore, all but the marginal worker are overcompensated by the market!

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Can the Compensating Wage Differential go the "Wrong" Way?

- What about workers that like risk and get utility from it (e.g. racing car drivers, test pilots, explorers, undercover agents)?
- Their reservation price is negative! They would pay to get a risky job even if it paid less than other jobs.
- If demand for workers in risky jobs is small there could be a negative compensating wage differential for such workers (see Figure 6.3).
- Firms might get away with paying a lower wage for risky jobs!

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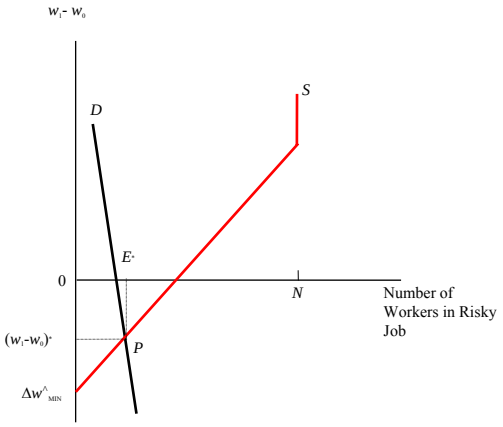
Figure 6.3: Market Equilibrium when Some Workers Prefer to Work in Risky Jobs



If some workers like to work in risky jobs (they are willing to pay for the right to be injured) and if the demand for such workers is small, the market compensating differential is negative. At point *P*, where supply equals demand, workers employed in risky jobs earn less than workers employed in safe jobs.

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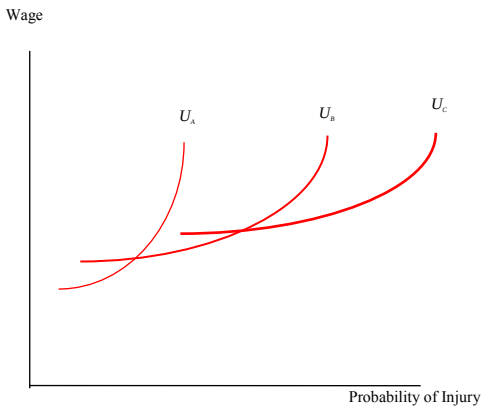
6.2 Hedonic Wage Theory

- Assume there are many types of firms (instead of just those offering safe or risky jobs). The probability of injury can take any value between 0 and 1.
- Workers maximise utility by choosing wage-risk combinations that offer them the greatest amount of utility. Assume workers dislike risk, but to different degrees, i.e. they have different optimal wage-risk combinations.
- Firms are on their isoprofit curves that give the risk-wage combinations that provide zero (economic) profit. They differ between firms.
- A hedonic wage function reflect the relationship between wages and job characteristics. It matches workers with different risk preferences with firms that can provide jobs that match these different risk preferences.

Figure 6.4: Indifference Curves for Three Types of Workers



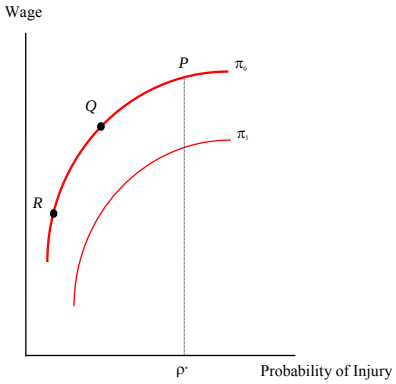
Different workers have different preferences for risk. Worker *A* is very risk-averse. Worker *C* does not mind risk as much.

The slope of an indifference curve is the reservation price a worker attaches to moving to a slightly riskier job.

Isoprofit Curves for Different Wage-Risk Job Packages

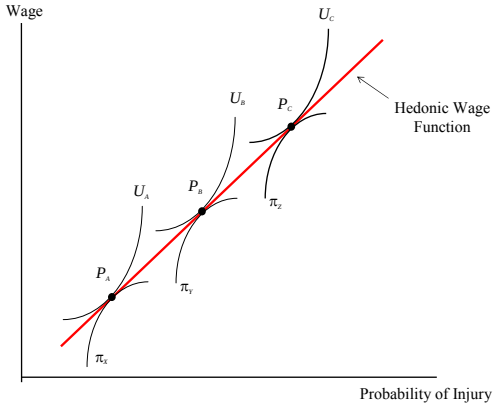
- An isoprofit curve gives all the risk-wage combinations that yield the same level of profits to a firm.
- Isoprofit curves are upward sloping because production of safety is costly.
- Wage-risk combinations on higher isoprofit curves yield lower profits. A wage cut shifts the isoprofit curve down.
- Isoprofit curves are concave because production of safety is subject to the law of diminishing returns. Reducing risk of job injury is at first relatively cheap, but becomes more expensive the further risk is reduced.
- Assume a competitive market, i.e. all firms will have zero (economic) profit. All wage-risk combinations of the different firms will lie on their "zero-profit" isoprofit curves.

Figure 6.5: Isoprofit Curves



Because it is costly to produce safety, a firm offering risk level ρ* can make the workplace safer (i.e. move left on horizontal axis) only if it reduces wages (while keeping profits constant), so that the isoprofit curve is upward sloping. Higher isoprofit curves yield lower profits.

Figure 6.5: The Hedonic Wage Function



Different firms have different isoprofit curves and different workers have different indifference curves. The labour market marries workers who dislike risk (such as worker *A*) with firms that find it easy to provide a safe environment (like firm *X*); and workers who do not mind risk as much (worker *C*) with firms that find it difficult to provide a safe environment (firm *Z*). The observed relationship between wages and job characteristics is called a hedonic wage function.

6.3 Policy Application: How Much is a Life Worth?

- Data from Statistics New Zealand on work-related injuries in 2005 & 2006 was shown in class. (see Statistics NZ website for details, e.g. the publication "Injury Statistics – Work-related Claims: 2006", released on 30 October 2007).
- Studies report a positive relationship between wages and work hazards. Typical approach to estimate the hedonic wage function:

$$w_i = a\rho_I + \text{other variables}$$

The estimate for coefficient 'a' will give the wage change associated with a one-unit increase in the probability of injury.

- If the focus is on only fatal injuries, the approach can be used to calculate the 'statistical value of life'.

Statistical Value of a Life ctd.

- Workers who are exposed to a higher probability of fatal injury earn more. 2002 US consensus estimate: A 0.001-point increase in the probability of fatal injury (i.e. one more death in a thousand workers) may increase annual earnings by about US$ 6,600 for workers in such risky jobs.
- The US$ 6,600 is the workers' reservation price for the riskier jobs. If there are 1000 workers in a firm, the statistical value of life is US$ 6,600*1000= US$ 6.6 million.
- The statistical value of life is the amount that workers are jointly willing to pay to reduce the likelihood that one of them will suffer a fatal injury in a given year on the job.

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Statistical Value of a Life ctd.

- Evidence on the statistical value of a life is uncertain, since there is variation in estimates of the correlation between wages and the probability of injury. But it is used in policy making.
- For some NZ evidence and general comments on the approach of estimating the statistical value of life see, for example: **Access Economics (2006),** ***The economic and social costs of occupational disease and injury in New Zealand – NOHSAC Technical Report 4*****, Wellington**, especially section 2.3 availalable at: http://www.nohsac.govt.nz/techreport4/index.php?section=sec2:s3:p024:
- They report a mid-range estimate for NZ of **NZ$ 6.9 million**.

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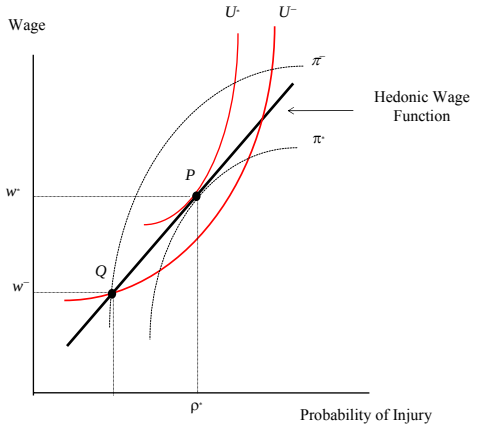
6.4 Policy Application: Safety and Health Regulation (mostly US specific, not relevant for exam purposes)

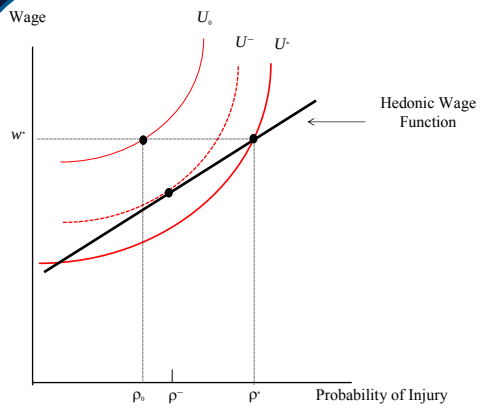
- In the US, the Occupational Safety and Health Administration (OSHA) sets regulations that are aimed at reducing risks in the work environment. In practice, this is not very successful in reducing workers' injury rates.
- Mandated standards reduce the utility of workers and the profits of firms (see Figure 6.7).
- Safety regulations can improve workers' welfare as long as workers consistently underestimate the true risks (see Figure 6.8).

Figure 6.7: Impact of OSHA Regulation on Wage, Profits, and Utility



A worker maximises utility by choosing the job at point *P*, which pays a wage of *w** and offers a probability of injury of ρ*. The US government prohibits firms from offering a probability of injury higher than ρ–, shifting both the worker and the firm to point *Q*. As a result, the worker gets a lower wage and receives less utility (from *U** to *U*–), and the firm earns lower profits (from π* to π–).

Figure 6.8: Impact of OSHA Regulations when Workers Misperceive Risks on the Job



Workers earn a wage of *w** and incorrectly believe that their probability of injury is only ρ_0. In fact, their probability of injury is ρ*. The US government can mandate that firms do not offer a probability of injury higher than ρ–, making the uninformed workers better off (that is, increasing their actual utility from *U** to *U*–).

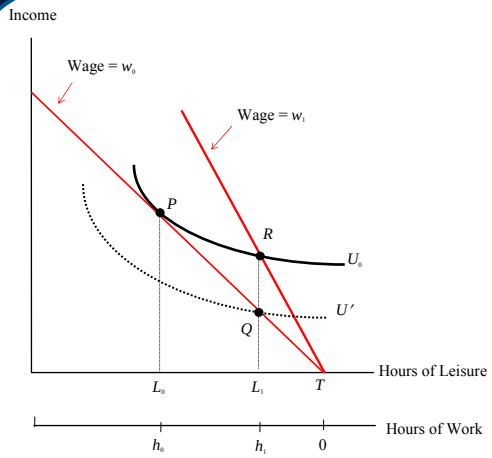
Some Comments on NZ

- Role of New Zealand's Accident Compensation Corporation (ACC). See the ACC website **http://www.acc.co.nz/index.htm**
- There is a brief write-up about ACC plus some statistics in the **New Zealand Official Yearbook 2006**: Chapter 8, section 7, pp. 165-167. (handed out in class)
- For some comparisons of the US and NZ systems see, for example, Marie Bismark and Ron Peterson (2006), 'No-fault compensation in New Zealand', *Health Affairs*, 25(1), pp. 278-83. (handed out in class, available from http://www.commonwealthfund.org/publications/publications_show. htm?doc_id=355233)

6.5 Compensating Differentials and Job Amenities

- Applicability of hedonic wage theory to different kinds of job characteristics, e.g. job security, predictability of layoffs, work schedules, work hours, geographical location?
- As long as all persons in the population agree on whether a job characteristics is good or bad, good job characteristics are associated with low wage rates & bad job characteristics are associated with high wage rates, i.e. in that case the theory applies. This assumption is unlikely to hold.
  - The empirical evidence is not clear on the link between job amenities and wage differentials, except for the risk of death.
  - Note that the theory focuses on the marginal worker (the marginal worker's reservation price).
  - Note also that better results supporting the theory are obtained if studies focus on individual workers and their job amenities in different jobs. This approach controls for the 'ability bias'.

Figure 6.9: Layoffs and Compensating Differentials



At point P, a person maximises utility by working h_0 hours at a wage of w_0 dollars. An alternative job offers the worker a seasonal schedule, where she gets the same wage but works only h_1 hours. The worker is worse off in the seasonal job (her utility declines from U_0 to U' utils). If the seasonal job is to attract any workers, the job must raise the wage to (w_1) so that workers will be indifferent between the two jobs.

- Figure 6.9 ctd.:
  In short, the wage already compensates the worker for the (known) layoff (this idea goes back to Adam Smith). Why then pay unemployment benefit for such seasonal unemployment?
- Evidence suggests that the unemployment benefit systems substitutes for compensating wage differentials.
- Case study: HIV, sex workers, nurses and compensating wage differentials!

End of Chapter 6