Chapter 4

Labour Market Equilibrium

Introduction

- Labour market equilibrium coordinates the desires of firms and workers, determining the wage and employment observed in the labour market.

- Market types analysed in this chapter:
  - Perfect competition – many buyers and sellers of labour
  - Monopsony – only one buyer of labour
  - Monopoly – only one seller of the output

- These market structures generate unique labour market equilibria.

- Only the competitive market is ‘efficient’ (example of the invisible hand theorem).
4.1 Equilibrium in a Single Competitive Labour Market

- Competitive equilibrium occurs when supply equals demand generating a competitive wage and employment level.

- It is unlikely that the labour market is ever in equilibrium, since supply and demand are dynamic. There are usually lots of shocks that shift both the demand and supply curve.

- The model suggests that the market is always in a state of moving toward equilibrium.

Efficiency

- It is important to note the technical meaning of efficiency in neoclassical economics:
  - Taken as Pareto Efficiency, this is the condition that exists when all possible gains from trade have been exhausted.
  - A corollary of this condition is that when the state of the world is Pareto Efficient, to improve one person’s welfare necessarily means another person’s welfare is decreased.
  - In policy applications, the efficiency criterion asks whether a change can make any one better off without harming anyone else. If the answer is yes, then a change is said to be “Pareto-improving”. Note: Such a situation hardly ever occurs.
Figure 4-1: Equilibrium in a Competitive Labour Market

The labor market is in equilibrium when supply equals demand; \( E^* \) workers are employed at a wage of \( w^* \). In equilibrium, all persons who are looking for work at the going wage can find a job (i.e. no involuntary unemployment).

The triangle \( P \) gives the **producer surplus**; the triangle \( Q \) gives the **worker surplus**. A competitive market maximises the gains from trade, or the sum \( P + Q \), resulting in an ‘efficient allocation’ of labour resources.

4.2 Competitive Equilibrium Across Labour Markets

- Assume: Two regions. Workers in each region are perfect substitutes. To start off with, the equilibrium wages in the two regions differ.

- If workers were mobile and entry and exit of workers to the labour market was free, then the wage differential could not persist. In the end there would be a single wage paid to all workers.

- The allocation of workers to firms equating the wage to the value of marginal product is also the allocation that maximises national income (this is known as **allocative efficiency**)

- The “invisible hand” process of self-interested workers and firms accomplishes a social goal that no one had consciously sought, i.e. allocative efficiency. *(At least in theory!)*
Efficiency Revisited

- The “single wage” property of a competitive equilibrium across markets has important implications for economic efficiency.

  - Recall that in a competitive equilibrium the wage equals the value of marginal product of labour. As firms and workers move to the region that provides the best opportunities, they eliminate regional wage differentials. Therefore, workers of given skills have the same value of marginal product of labour in all markets.

Figure 4-2: Competitive Equilibrium in Two Labour Markets Linked by Migration

Suppose the wage in the northern region \( w_N \) exceeds the wage in the southern region \( w_S \). Southern workers want to move North, shifting the southern supply curve to the left and the northern supply curve to the right. In the end, wages are equated across regions (at \( w^* \)). [Note: If firms move South, the northern labour demand curve shifts left, the southern labour demand curve shifts right.]
**Figure 4-3: Wage Convergence Across US States**


**Wage and Income Convergence**

- **Figure 4-3:** *Inverse relationship* between the two variables, i.e. US states that had low manufacturing wages in the base year 1950 had higher wage growth subsequently compared to states that had high manufacturing wages in 1950.

- There is a large empirical literature on wage and income (i.e. per capita income) convergence (a) across regions within countries and (b) between countries (e.g. do poor countries have a tendency to catch up with rich countries over time?).
Wage and Income Convergence ctd.

**There are a number of ‘convergence concepts’ in the literature.** Borjas just mentions ‘conditional’ convergence.
- Usually covered in macroeconomics (i.e. economic growth).

**Textbook example: Wages and International Trade**
 - NAFTA created a free trade zone in North America.
 - The effect of free trade in the zone is to reduce the income differential between the US and other countries in the zone, such as Mexico.
 - Total income of the countries in the trade zone is maximised as a result of equalised economic opportunities across the countries in the zone. Winners and losers.

4.3/4.4 Policy Application: Payroll Taxes, Subsidies, Mandated Benefits

**These two sections have not been covered in class. They are not compulsory (i.e. not relevant for examination purposes).**

**NZ used to have a payroll tax (in the narrow sense) in the 1970s, but it was quickly abolished.**


4.5 Policy Application: The Labour Market Impact of Immigration

- We start with the simplest model:
  - Immigrants and natives are perfect substitutes in production, i.e. it is assumed they compete for the same types of jobs. *(highly unlikely!)*
  - Short-run impact (capital held fixed): As immigrants enter the labour market, the labour supply curve shifts to the right, i.e. out (Figure 4.10).
  - Total employment increases. Equilibrium wage decreases.
  - Increases in immigration reduce the wages and employment of native-born workers.

Figure 4-10: The Short-Run Impact of Immigration when Immigrants and Natives are Perfect Substitutes

Because immigrants and natives are perfect substitutes, the two groups are competing in the same labour market. Immigration shifts out the supply curve. As a result, the wage falls from $w_0$ to $w_1$, and total employment increases from $N_0$ to $E_1$. Note that at the lower wage, there is a decline in the number of natives who work, from $N_0$ to $N_1$. 
Native-Born Workers

- The simplest model is probably much too simple:
  - Immigrants and native workers might not be perfect substitutes.
  - If immigrants are less skilled than natives, native-born workers may be able to increase their productivity since they can specialise in tasks better suited to their skills.
  - Competing (low skilled) native workers will have lower wages; but higher skilled native workers will have higher wages.
  - Overall, immigrants and native workers might be complements in production (Figure 4.11).

Figure 4-11: The Short-Run Impact of Immigration when Immigrants and Natives are Complements

If immigrants and natives are complements, they are not competing in the same labour market. The labour market in this figure denotes the supply and demand for native workers. Immigration makes natives more productive, shifting out the demand curve even though capital is fixed. This leads to a higher native wage and to an increase in native employment.
The Long-Run Impact of Immigration

• Assume again that immigrants and natives are perfect substitutes.
  - Short-run impact: Wage lower, return to capital higher.
  - Long-run impact: More capital will be attracted over time, shifting out the labour demand curve, thereby undoing (some?) of the negative impact on the wage of the initial outward shift of the labour supply curve.
  - Crucial question: By how much will the labour supply curve shift out in the long-run?
    • Depends on the technology underlying the production function.
      - Example: Cobb-Douglas production function with constant returns to scale (CRS).
      - If the capital-labour ratio is constant in the long-run, immigration will have NO EFFECT on the equilibrium wage and price of capital (in the long-run). Applies if the aggregate production function has CRS!

Figure 4-12: The Long-Run Impact of Immigration when Immigrants and Natives are Perfect Substitutes

Because immigrants and natives are perfect substitutes, the two groups are competing in the same labour market. Immigration initially shifts out the supply curve. As a result, the wage falls from \( w_0 \) to \( w_1 \). Over time, capital expands as firms take advantage of the cheaper workforce, shifting out the labour demand curve.
The Long-Run Impact of Immigration ctd.

- Empirical tests of whether immigrants and natives are substitutes and complements seem to indicate that there is a very small negative correlation between native and immigrant wages (i.e. the two types of workers are weak substitutes). (Borjas, p. 172)

- The sections entitled ‘The Mariel Boatlift’ and ‘Natural Experiment: Proceed with Caution’ are not relevant for the final exam (Boras, p. 173-177). However, they are very interesting in that they report conflicting empirical evidence (see next slide) and they might be relevant for your essay.

[Conflicting Evidence: Figure 4-13 - The Short-Run Labor Demand Curve Implied by Different Natural Experiments]

(a) The analysis of data resulting from the Mariel natural experiment implies that increased immigration does not affect the wage, so that the short-run labor demand curve is perfectly elastic. (b) The analysis of data resulting from the NJ-Pennsylvania minimum wage natural experiment implies that an increase in the minimum wage does not affect employment, so that the short-run labor demand curve is perfectly inelastic.
Do Natives Respond to Immigration?

- Figure 4-14:
  - Initially, the equilibrium wage is the same in both labour markets ($w_0$).
  - Migrants to LA (or Auckland) shift the supply curve out to $S_1$. This fall in the wage causes some LA natives to move to Pittsburgh (or Wellington): The supply curve there shifts out, and the supply curve in LA (Auckland) shifts in somewhat.
  - In the new equilibrium, there is again the same wage in both labour markets, but it is lower than before!
  - As a result, all natives, regardless of where they live in the country, are worse off (in the short run) because of immigration. However, evidence on this is mixed.

Figure 4-14: The Native Labour Market’s Response to Immigration
Immigration and the Wage Structure (the national level approach to assessing the wage impact of immigration)

- Look at evolution of national wage structure to find out about the wage impact of immigration. Don’t look at how different local labour markets are affected.

- Approach: Divide native labour force into different skill groups (e.g. classified by education level and years of work experience) and analyse whether the wage growth experienced by these skill groups over a period of time is related to the number of immigrants in these groups (see Figure 4-16).
  - The empirical evidence for the US suggests a negative correlation: At the national level wages grew fastest for those skill groups least affected by immigration! (short to medium term effect)

Figure 4-16: Scatter Diagram Relating Wages and Immigration for Native Skill Groups in the US
4.6 The Economic Benefits from Immigration

- How to estimate the (short-run) net economic impact of immigration?
- Figure 4-17:
  - Area under the labour demand curve up to the equilibrium point gives the value of the national income.
  - Assume natives and immigrants are perfect substitutes in production (would this be realistic in the NZ case?).
  - Calculate ‘immigration surplus’ (the increase in national income due to immigration; it goes to natives).
  - Why is there such a surplus? Because all immigrants hired except for the last one increase national income by more than it costs to employ them.
  - Note: The immigration surplus only exists if the native wage rates fall (not if demand curve for natives is perfectly elastic). Immigration redistributes income from labour to capital!

Figure 4-17: The Immigration Surplus

Prior to immigration, there are \( N \) native workers in the economy and national income is given by the trapezoid \( ABN0 \). Immigration increases the labour supply to \( M \) workers and national income is given by the trapezoid \( ACM0 \). Immigrants are paid a total of \( FCMN \) dollars as salary. The immigration surplus gives the increase in national income that accrues to natives and is given by the area in the triangle \( BCF \).
The Immigration Surplus

• See formula to calculate the immigration surplus (p. 184).
  • The estimates seem to be small.

• The ‘immigration surplus’ concept has some **weird implications**:
  - It is only a short-run concept.
  - In the long-run, neither the wage rate nor the return to capital is affected by immigration, i.e. the immigration surplus is zero (GDP↑ due to immigration, but in the end former immigrants receive what they contribute to GDP).
  - In a sense, the economic benefit of the immigration surplus requires that natives get hurt by immigration (in form of a lower wage). The lower the native wage as a result of immigration, the greater the economic benefits! **OKAY IF YOU ARE A CAPITALIST!**

4.7 Policy Application: Hurricanes and the Labour Market

• Hurricanes generate exogenous economic shocks that affect labour market conditions.

• We can use data to estimate difference-in-difference models that examine the economic impact on affected Florida counties relative to unaffected counties.

• Table 4-4: 19 hurricanes that hit Florida between 1988 and 2005.
Table 4-5: Changes in Employment and Wages in Florida Counties Hit by Hurricanes (relative to average change in Florida)

<table>
<thead>
<tr>
<th>Effect of Hurricane</th>
<th>Percent change in employment</th>
<th>Percent change in earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Effect of category 1-3 hurricane on county directly hit</td>
<td>-1.5</td>
<td>+1.3</td>
</tr>
<tr>
<td>2. Effect of category 4-5 hurricane on county directly hit</td>
<td>-4.5</td>
<td>+4.4</td>
</tr>
<tr>
<td>3. Effect of category 1-3 hurricane on neighboring county</td>
<td>+0.2</td>
<td>-4.5</td>
</tr>
<tr>
<td>4. Effect of Category 4-5 hurricane in neighboring county</td>
<td>+0.8</td>
<td>-3.3</td>
</tr>
</tbody>
</table>


Hurricanes and the Labour Market ctd.

- How does the theory of labour market equilibrium gain support from this data?
  - Labor supply decreases in counties directly hit, and more so in the more-affected counties. This increases wages and lowers employment.
  - Labor supply increases in neighboring counties. This decreases wages and increases employment.
  - Labour demand changes not so clear (see p. 187). Data consistent with labour supply changes mentioned above.
4.8 The Cobweb Model

- Two key assumptions of the cobweb model:
  - Time is needed to produce skilled workers (e.g. engineers, medical doctors, IT specialists, academics). Therefore, assume the short-run supply curve is perfectly inelastic!
  - Persons decide to become skilled workers by looking at conditions in the labour market at the time they enter university or polytech. *(Is this a realistic assumption?)*

- This creates systematic boom and bust cycles for the entry wages in these labour markets (i.e. a “cobweb” pattern forms around the long-run equilibrium).

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**Figure 4-18: The Cobweb Model in the Market for New Engineers**

The initial equilibrium wage in the engineering market is $w_0$. The demand for engineers shifts to $D_1$, and the wage will eventually increase to $w^*$. Because new engineers are not produced instantaneously and because students might misforecast future opportunities in the market, a cobweb is created as the labour market adjusts to the increase in demand.
Cobweb Model (continued)

• The cobweb pattern arises when people are misinformed.
• The model implies naïve workers who do not form “rational expectations”.
• **Rational expectations** are formed if workers correctly perceive the future and understand the economic forces at work.
  - **Note**: How economic agents form expectations is a big and crucial topic in (micro- and macro-) economics. ‘Rational expectations’ a misnomer. It is better to call them ‘model-consistent expectations’.
• However, it takes time and resources to get all the information necessary to form rational expectations. **It can be rational not to have rational expectations!**
  - **Note**: Cobwebs do exist in many professional labour markets! Economic forecasting is very difficult.

4.9 Noncompetitive Labour Markets: Monopsony

• A monopsonistic market exists when a firm is the sole buyer of labour (acting as a sole employer of labour in the market; it has “monopsony power”). Example: One company town.
• Such a firm must increase wages to attract more workers, i.e. it faces an upward-sloping labour supply curve.
  - This is the key feature and might apply even if the firm is not the sole employer in a labour market (see p. 195/6 on mobility and monitoring costs)!
• Two types of monopsony: **Perfectly discriminating & Nondiscriminating.**
Perfectly Discriminating Monopsonist

- Able to hire different workers at different wages.
- When “perfectly discriminating” each worker is paid his or her reservation wage.
- The monopsonistic firm should hire workers up to the point where the last worker’s contribution to firm revenue (or VMP_E) equals the marginal cost of labour.
  - This results in the same employment level as under perfect competition. But note that the ‘equilibrium’ wage is not the competitive wage because it is only paid to the last worker hired!
  - If this happened in reality, most people would greatly resent it.

Figure 4-19: The Hiring Decision of a Perfectly Discriminating Monopsonist

A perfectly discriminating monopsonist faces an upward-sloping supply curve and can hire different workers at different wages. The labour supply curve gives the marginal cost of hiring. Profit maximisation occurs at the intersection point. The monopsonist hires the same number of workers as in the case of a competitive market, but each worker gets paid his/her reservation wage.
Nondiscriminating Monopsonist

- Must pay all workers the same wage, regardless of each worker’s reservation wage.
- Must raise the wage of all workers when attempting to attract more workers, i.e. the labour supply curve no longer gives the marginal cost of hiring.
  - Try to understand the numerical example in Table 4-6.
- As the firm expands, i.e. hires more workers, it incurs an ever higher marginal cost. The Marginal Cost of Labour curve (MC) is upward sloping and lies above the labour supply curve.
- The nondiscriminating monopsonist hires up to the point where $MC = VMP$. As a result, the firm (a) employs fewer workers than would be employed if the market were competitive and (b) pays less than the competitive wage ($w_M$ instead of $w^*$)(also note that $w_M$ is less than the VMP).

Figure 4-20: The Hiring Decision of a Nondiscriminating Monopsonist

A nondiscriminating monopsonist pays the same wage to all workers. The marginal cost of hiring exceeds the wage, and the marginal cost curve lies above the supply curve. Profit maximisation occurs at point $A$; the monopsonist hires $E_M$ workers and pays them a wage of $w_M$.

This is an inefficient allocation of resources and workers are ‘exploited’ (get less than their VMP).
Monopsony and the Minimum Wage

- IF the government sets a minimum wage somewhere between \( w_M \) and the competitive wage, both the wage and employment will increase in this labour market.
  - Empirical studies suggest this might be the case for youth employment in the fast food industry in the US (the argument is that unskilled teenagers can find little other employment).

- In theory, the minimum wage could be set at the competitive wage level, thereby resulting in the employment level that would be observed in a competitive market.

Figure 4-21: The Impact of the Minimum Wage on a Nondiscriminating Monopsonist

The minimum wage may increase both wages and employment when imposed on a monopsonist. A minimum wage set at \( w^* \) increases employment to \( E^* \).
Can a Competitive Firm Have an Upward-Sloping Labour Supply Curve?

- The short answer is yes. Even competitive firms can have some degree of monopsony power. Some of the main reasons are:
  - Workers face ‘**mobility costs**’ when changing jobs:
    - Job search costs, moving costs, different housing costs in new versus old location, benefits lost when changing jobs (e.g. company pension) etc.
    - Therefore, it does not necessarily make economic sense for a worker to accept a job paying a higher wage somewhere else. Firms (even competitive ones) need to pay higher wages to compensate newly hired workers for their mobility costs.
  - When firms grow, supervising increasing numbers of workers often becomes more difficult (**monitoring costs** increase).
    - Firms want to prevent ‘**shirking**’ of workers. They offer a higher wage when firm size increases so that workers have ‘something to lose’ if they don’t perform! Maybe that is why larger firms often pay higher wages.

4.10 Noncompetitive Labour Markets: Monopoly

- **Monopoly**: Only one seller of the output in the market.
- Firms that have monopoly power can influence the price of the product that they sell.
- Monopolist faces a **downward sloping market demand curve** for its output, i.e. marginal revenue is lower than output price p.
  - If the firm wants to sell another unit of output, it has to reduce p for all customers!
  - Marginal revenue keeps declining with increase in output and eventually becomes zero or negative!
- Profit-maximising point for monopolist where **MR=MC**. A monopolist sells less output at a higher price than a competitive firm!
Figure 4-22: The Output Decision of a Monopolist

A monopolist faces a downward-sloping demand curve for its output. The marginal revenue from selling an additional unit of output is less than the price of the product. Profit maximisation occurs at point $A$; a monopolist produces $q_M$ units of output and sells them at a price of $p_M$ dollars.

Monopoly and Labour Demand

- Because $MR$ is below $p$, the $VMP_E$ as defined in chapter 3, p. 92, is not relevant for the monopolist’s hiring decision.

- The additional revenue from hiring an extra worker is, instead, the Marginal Revenue Product (MRP):

  \[
  MRP_E = MR \times MP_E
  \]

- The condition where the contribution of the last worker hired equals his/her cost to the firm (the profit-maximising condition) is therefore:

  \[
  MRP_E = w
  \]

- Because $MR < p \Rightarrow MRP_E < VMP_E$ (see Figure 4-23)
Figure 4-23: The Labour Demand Curve of a Monopolist

The marginal revenue product gives the worker’s contribution to a monopolist’s revenues and is less than the worker’s value of marginal product. Profit maximisation occurs at point $A$; the monopolist hires fewer workers ($E_M$) than would be hired in a competitive market.

Note bottom p. 198/top p. 199: Monopolists may have little incentive to hold down costs. In practice, they often pay a higher wage than the competitive wage and their customers pay for this with higher output prices.

End of chapter 4