Master in Economics

Labour economics – Lecture 2

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Lisbon School
of Economics
& Management
Universidade de Lisboa

Lecture 2

Topics:

How the Labour Market Works

- Labour demand
- Labour supply
- The Determination of the Wage

The demand for labour and labour elasticities

- Profit Maximization
- The Short-Run Demand for Labour when both Product and Labour Markets are Competitive
- The Demand for Labour in Competitive Markets when other Inputs can be varied

Bibliography:

- Ehrenberg, Ronald & Robert Smith, Modern Labor Economics: Theory and Public Policy– Chapters 2 and 3

Chapter 2: How the Labour Market Works

How the Labour Market Works

Firms operate in the labour, capital, and product markets

Firms purchase inputs – labour (L) and capital (K)

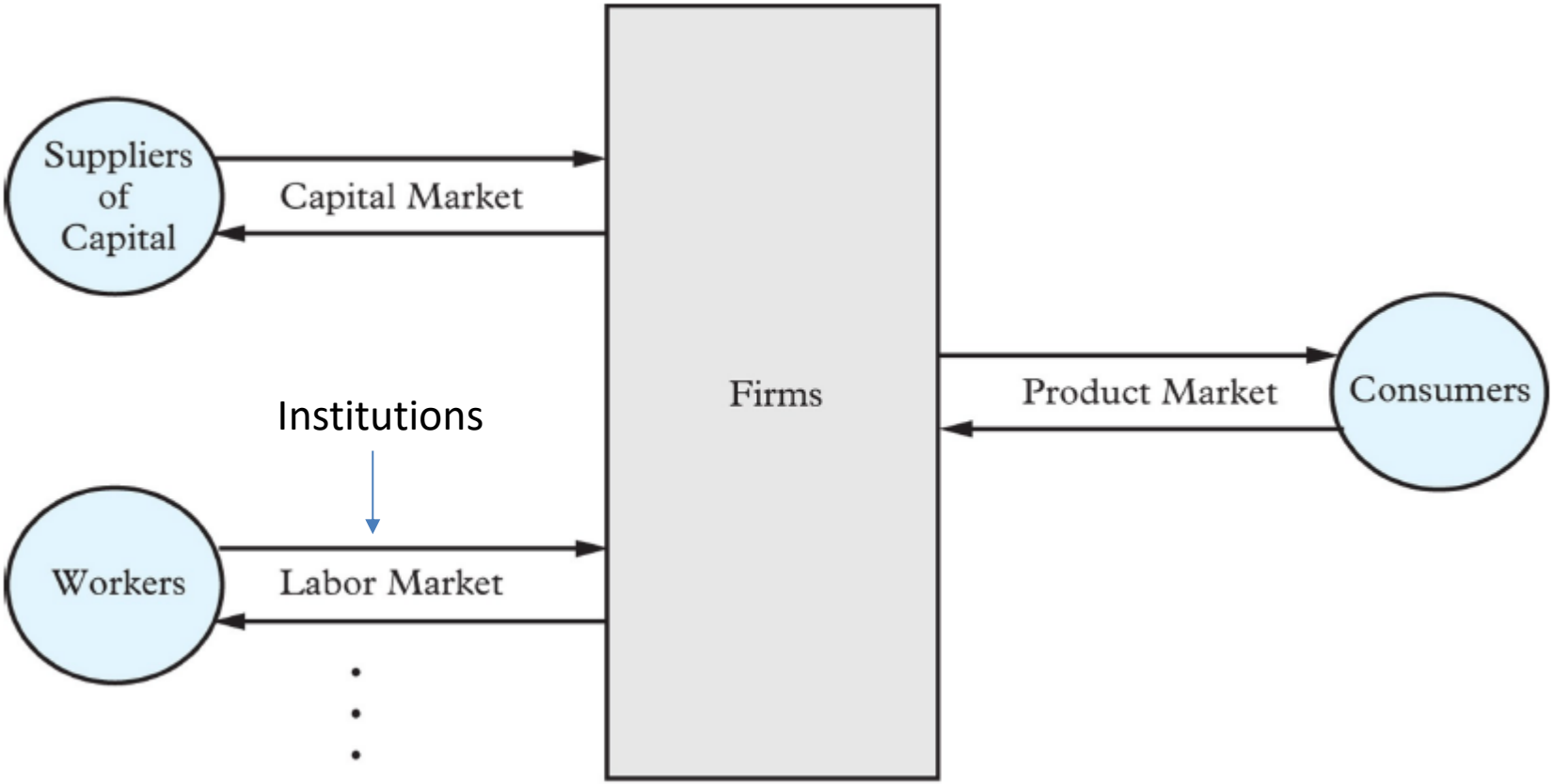
Study of the labour market – demand; supply; and institutions

- Employers demand for labour from different labour markets
- Employees supply their labour services
- Institutions

Major labour market outcomes:

- **Terms of employment** - wages, compensation levels, working conditions
- The **levels of employment** - by various occupational, skill or demographic groups

How the Labour Market Works



How the Labour Market Works: Demand for Labour

Firms combine *L* and *K*

Total output (*Q*) and inputs (*L* and *K*) depend on three forces:

- Product demand (Q^D)
- *L* and *K* acquired respectively at wages (*W*) and rental cost (r_K) or price (p_K)
- Technology (T) available to firms

Demand for labour: $L^D = f(W, Q^D, T)$

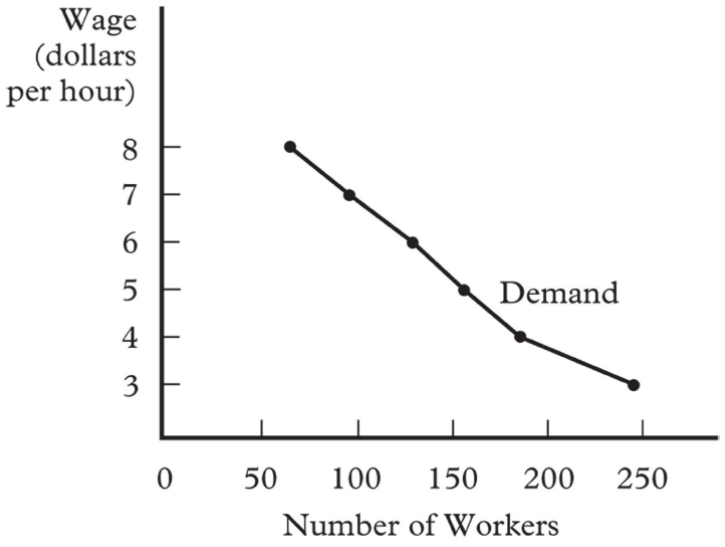
(where L^D = labour demand or employment by the firm)

Study the demand of labour - how the number of workers employed by a firm is affected by changes in one of those factors

How the Labour Market Works: Demand for Labour

Wage Changes - an increase in wage will lead to:

- A **scale or output effect** – higher wages, higher costs, lower demand
- A **substitution effect** – labour is substituted for capital

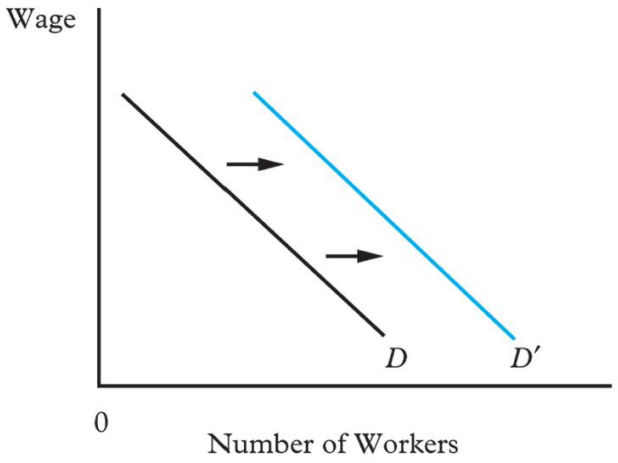


How the Labour Market Works: Demand for Labour

Changes in Other Forces Affecting Demand:

- If the **demand for the product (Q^D) increases**, holding other factors (L, W, K, r_K or p_K, and T) constant, this will lead to **scale or output effect** as firms try to maximize profits, thus leading to an **increase in labour demand**
- The **labour demand curve shifts to the right** at every possible wage level – **no substitution effect** if no change in the relative price of capital

Figure 2.7 Shift in Demand for Labor Due to Increase in Product Demand

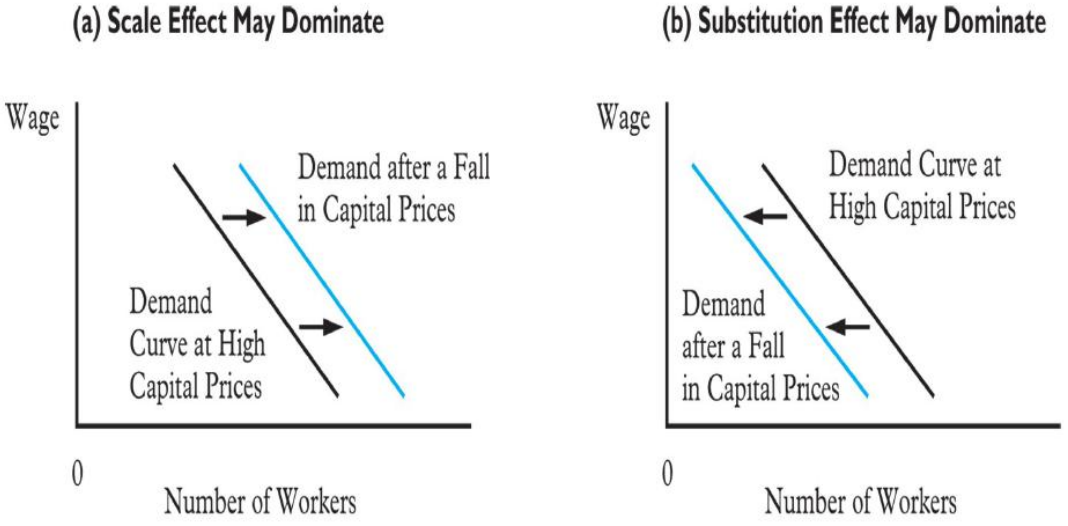


How the Labour Market Works: Demand for Labour

Changes in Other Forces Affecting Demand:

- If the **supply of capital changes** and r_K or p_K fell, but other factors remain unchanged, more *K* would be used in production process – generates **two opposite effects for L^D**:
  - **If the scale effect dominates**, more workers will be required as well, thus **L^D will shift to the right**
  - **If the substitution effect dominates, L^D will shift to the left**

Figure 2.8 Possible Shifts in Demand for Labor Due to Fall in Capital Prices



How the Labour Market Works: Demand for Labour

Market, Industry, and Firm Demand:

- The demand for labour can be analyzed on three levels
  - Firm – the demand for labour by a particular firm
  - Industry – in the entire industry
  - Market – market demand curve

Long Run versus Short run

- In the short run, employers find it difficult to substitute capital for labour (and vice versa) - this is also true for product demand
- It takes time to fully adjust consumption and production behaviour

How the Labour Market Works – Labour supply

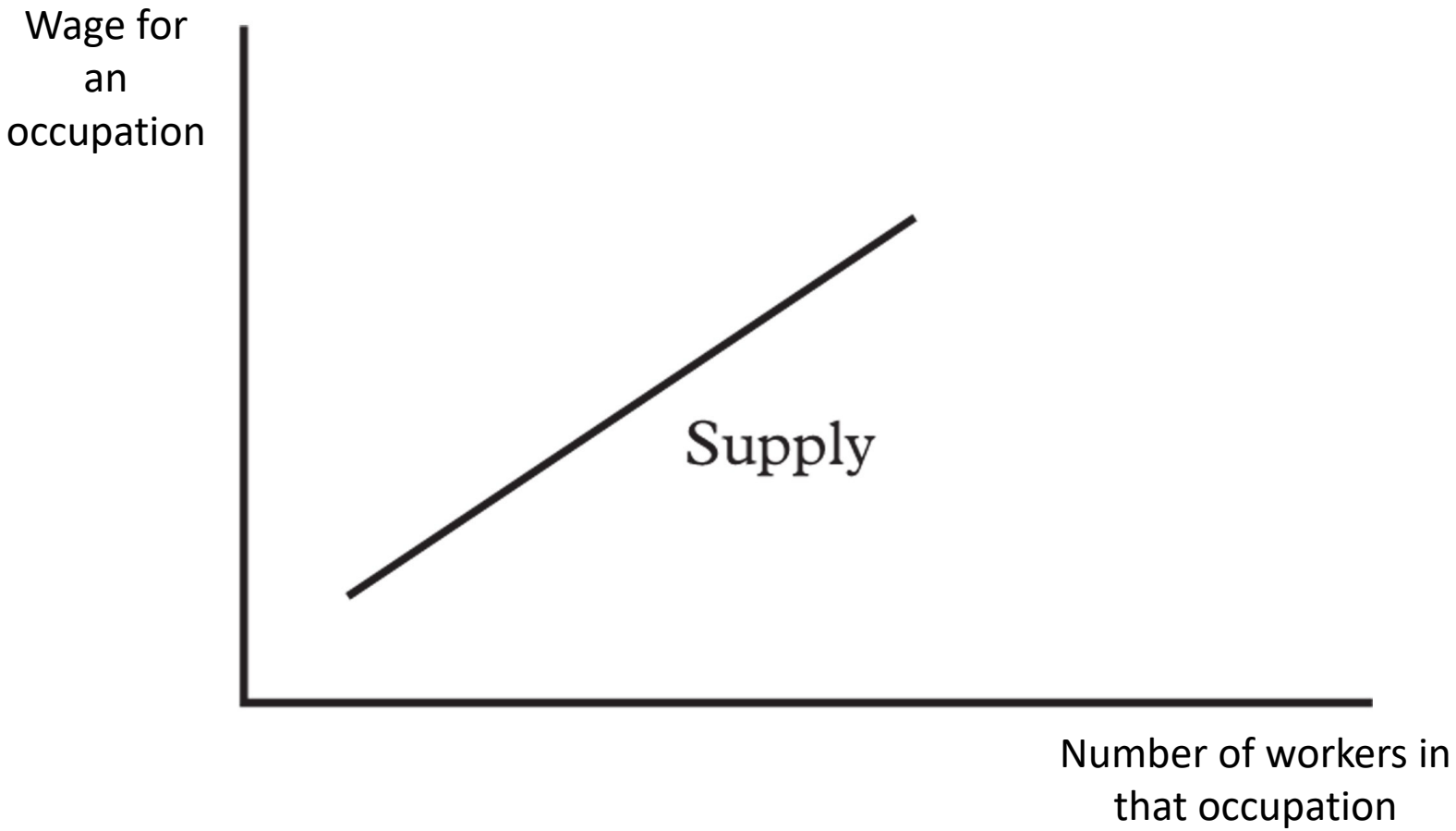
Assumption:

- Workers have already decided to work, but they must choose:
  - Occupation
  - Employer – the match

Market Supply – the supply of labour to the entire market

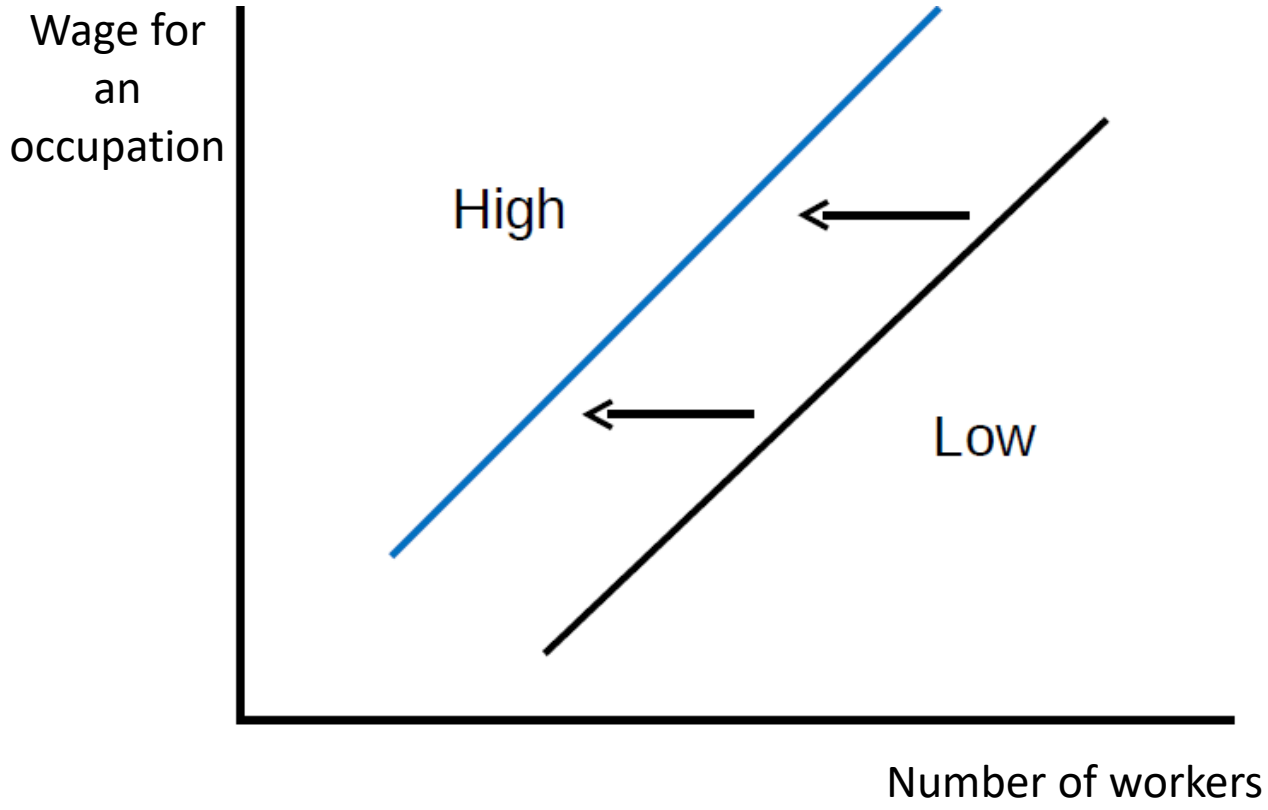
- If the **market wage** for a given occupation **increases** (*and the wages in other occupations are held constant*), there will be **more supply** for that occupation - **Labour supply for a given occupation will be upward-sloping**
  (the quantity of labour supplied will be positively related to the wage rate, holding wages of other occupations constant)
- If other factors change, the L^S curve for the occupation will shift

How the Labour Market Works – Labour supply



How the Labour Market Works – Labour supply

Shift in Market Supply Curve for an occupation when salaries for other occupations rise



How the Labour Market Works – Labour supply

Supply to Firms

- Having decided about occupation, the **worker has to decide which job offer to accept**
- Assume all job offers for a given occupation are more or less alike and they only differ about compensation
  - **Any firm paying below market wage would not attract any employees** and **no firm has incentives to pay more than the market wage**

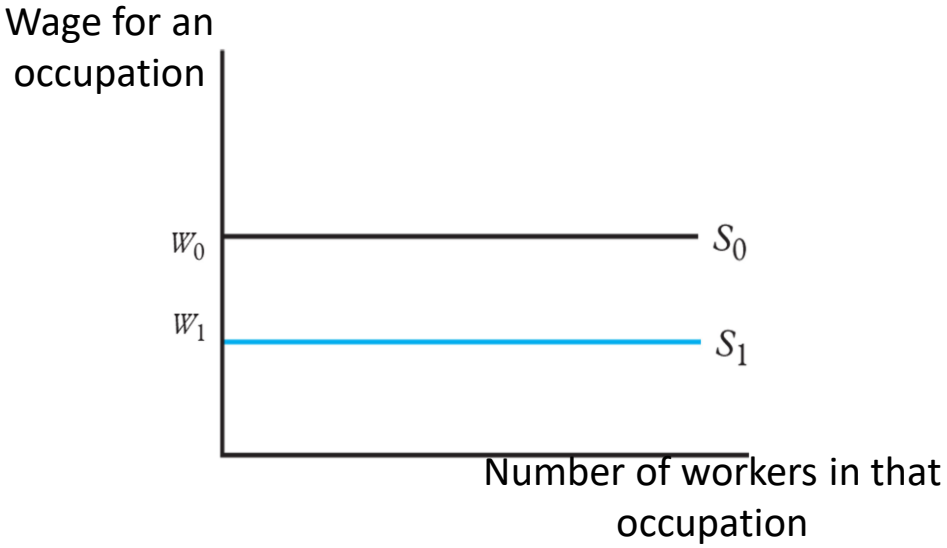
=>**Supply curves to a firm are horizontal**

At the going wage a firm can get all the workers it needs

How the Labour Market Works – Labour supply

Supply to Firms

- **Firms are wage takers**
  - At wage of W_0, employers can hire all the workers they need
  - If the wage falls from W_0 to W_1, employers can still hire as much as they want at the lower wage, and each firm's or employer's labor supply curve becomes S_1 with the same slope as the supply curve S_0



How the Labour Market Works – Labour supply

Difference of the slope between the market supply curve and the supply curve to a firm – different choices

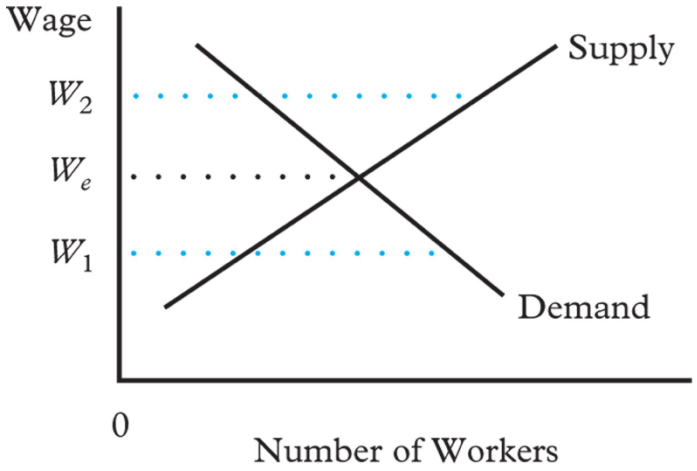
- **When deciding occupation**, workers **consider both compensation and job requirements**
- A **fall in the wage rate for a given profession does not mean all workers withdraw** from that profession because **professions are not perfect substitutes** - some workers don't like the job requirements of the other professions
- Once the decision of occupation has been made, the decision of **which employer to work for** is a choice in which job requirements are nearly the same – choice made only on the basis of compensation – **alternatives are perfect substitutes**

How the Labour Market Works: Determination of the wage

The wage rate depends on L^D and L^S

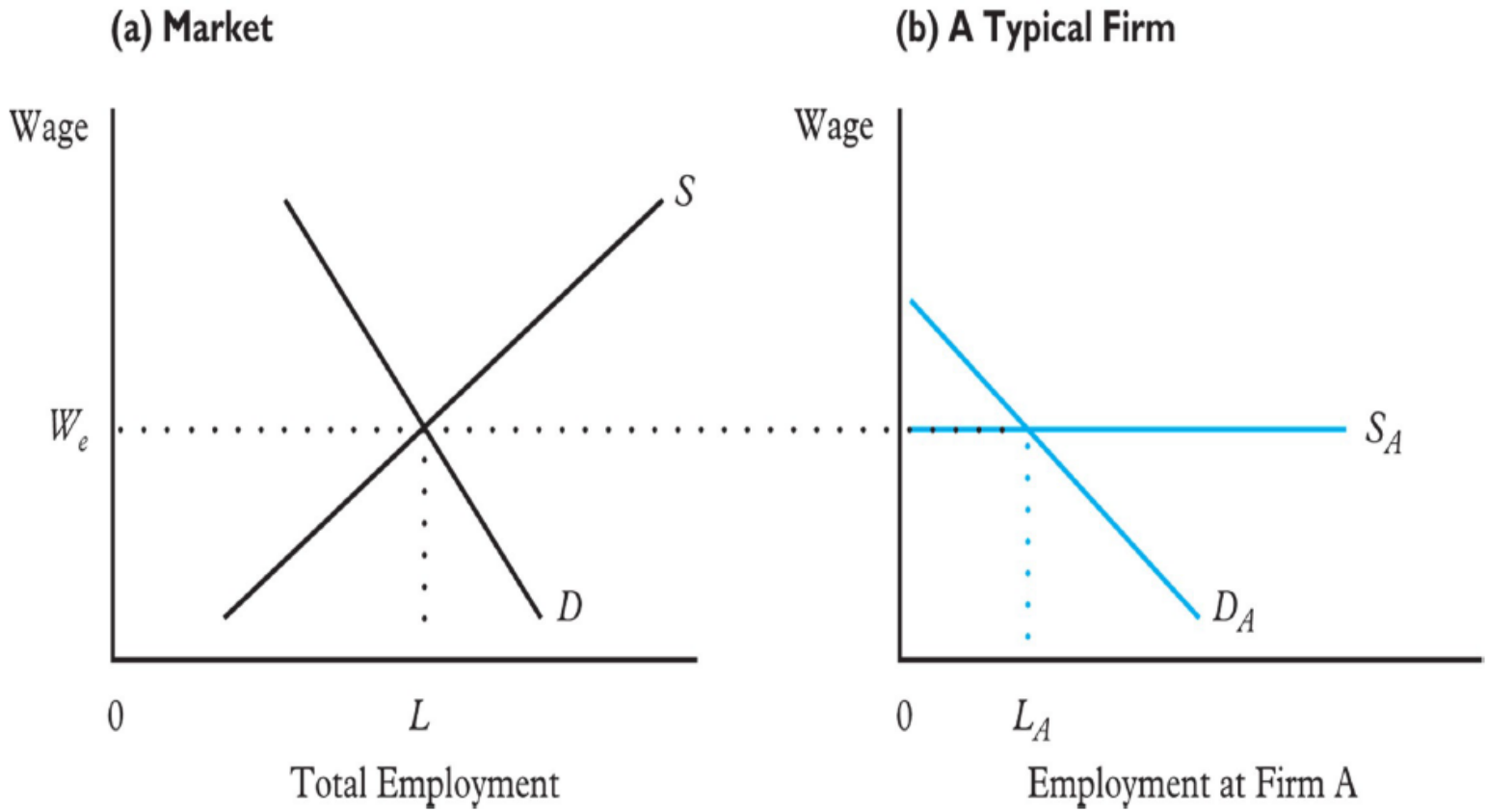
The market-clearing wage – W_e - $L^D = L^S$

- For any wage $W_1 < W_e$: $L^D > L^S$ → Excessive Demand for Labour - with adjustments from employers (pay more to attract workers) and employees (more workers choose to enter the market), wage rises to W_e
- For any wage $W_2 > W_e$: $L^D < L^S$ → Excessive Supply of Labour - with adjustments from workers, wage falls to W_e



How the Labour Market Works: Determination of the wage

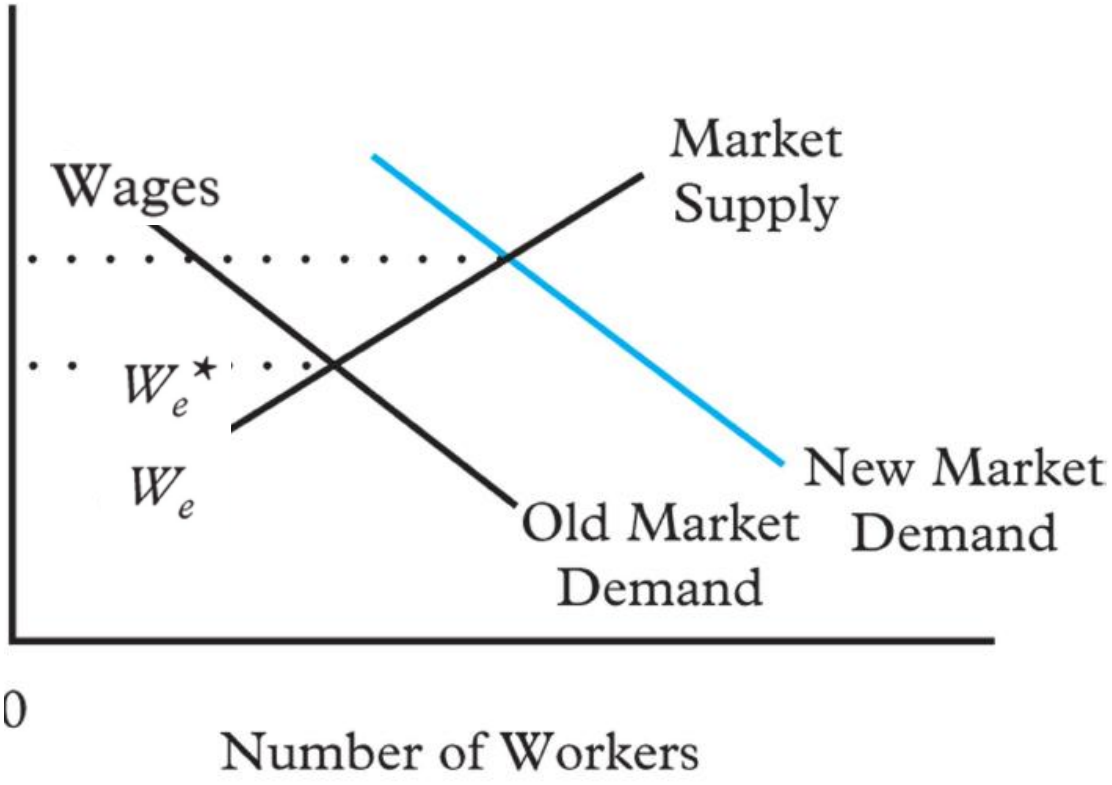
Demand and Supply at the "Market" and "Firm" Levels



How the Labour Market Works: Disturbing the Equilibrium

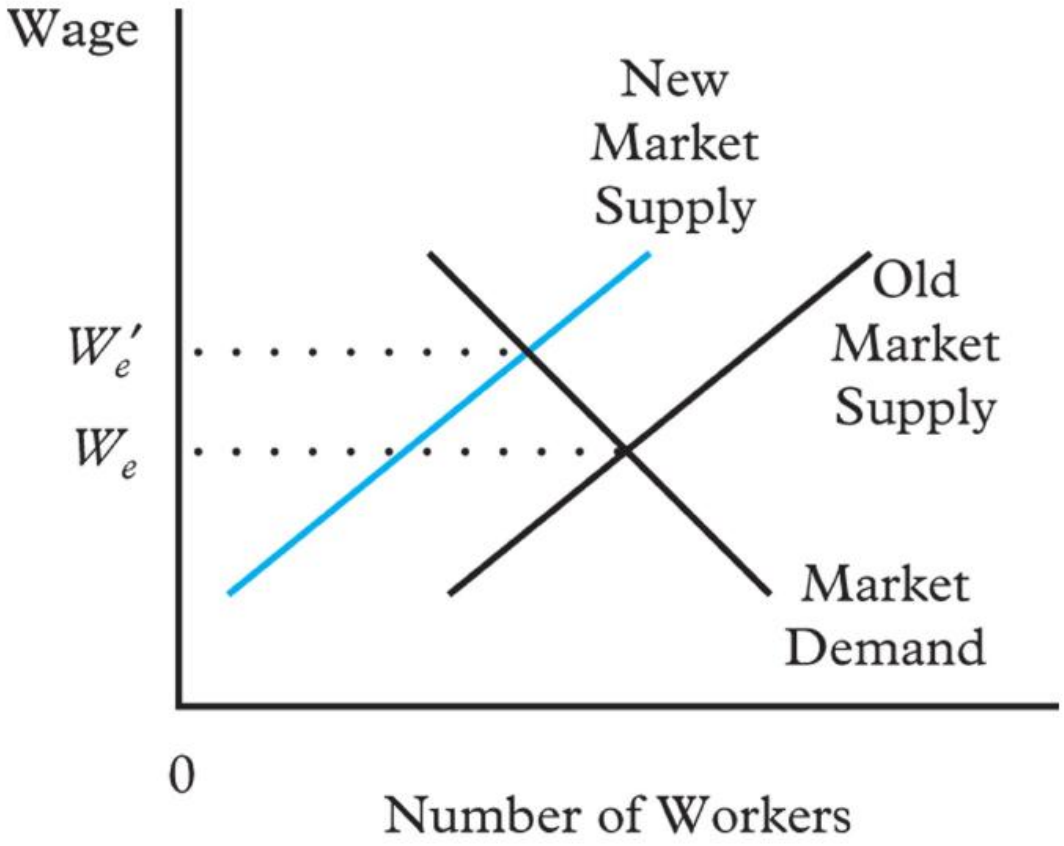
Changes in labour demand and/or labour supply will change the equilibrium wage (W_e) and employment (L)

- If L^D shifts to the right, W_e rises to W_e*



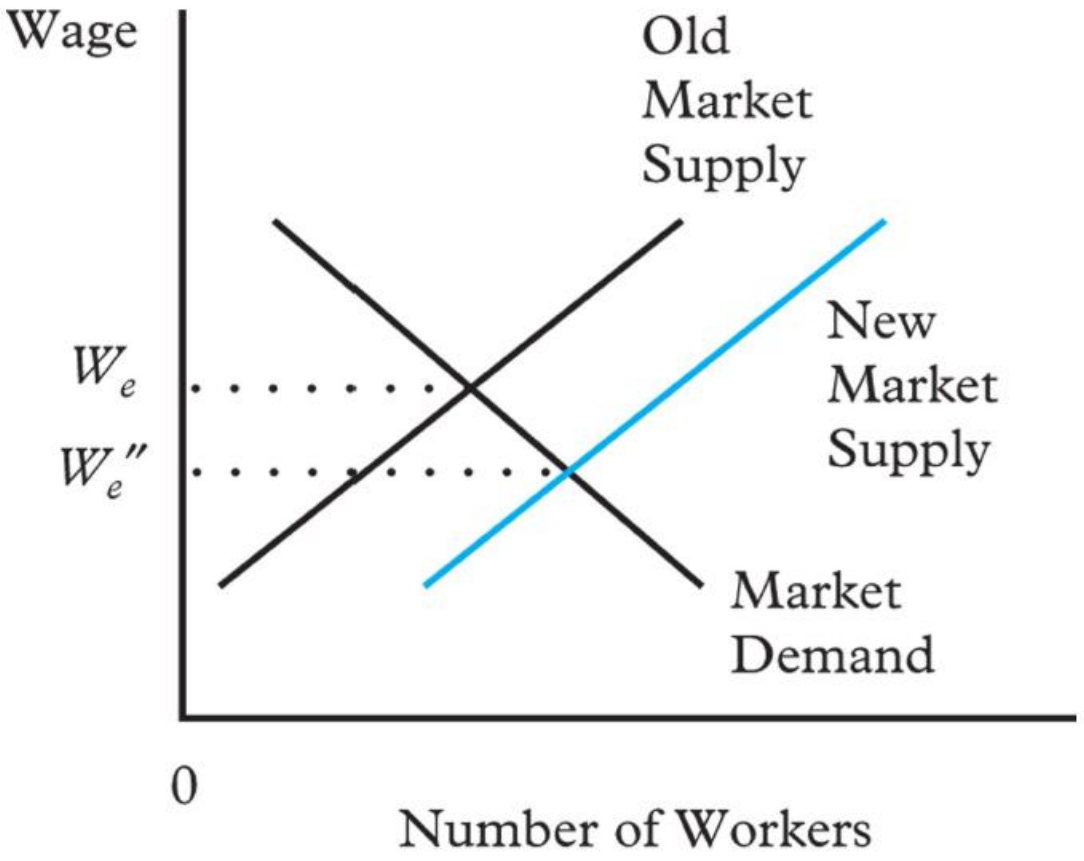
How the Labour Market Works: Disturbing the Equilibrium

If L^S shifts to the left, W_e rises to W_e'



How the Labour Market Works: Disturbing the Equilibrium

If the L^S curve shifts to the right, $W_e'' < W_e$



How the Labour Market Works: Disequilibrium and Nonmarket Influences

Labour Market subject to forces that impede the adjustment of both wages and employment to changes in supply or demand – equilibrium may not be reached, at least in the short run

- Changing jobs often requires an employee to invest in new skills or bear the costs of moving
- Hiring workers can involve an initial investment in search and training, while firing them or cutting their wages can be perceived as unfair, which may affect moral and productivity

How the Labour Market Works: Disequilibrium and Nonmarket Influences

Other adjustment barriers: nonmarket forces

- **Government programs or laws**: minimum wage laws (keep wages above market levels) could result in unemployment
- **Customs or institutions** (e.g. labour unions): constrain the choices

Empirical result: markets adjust more quickly to pressures to raise wages $\Rightarrow$ more likely to have situations with above market wages - unemployment

Applications of the Theory

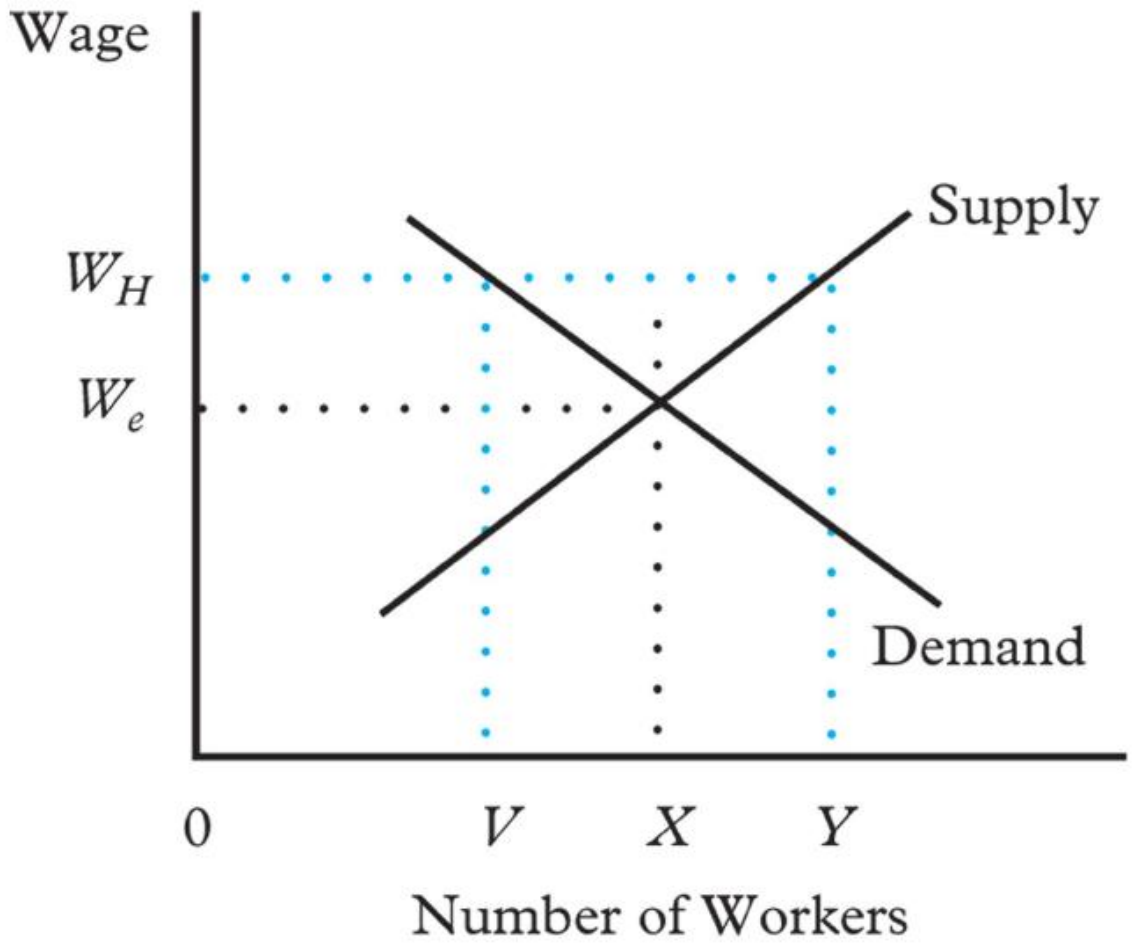
The simple model can be used to explain some features

1) Who Is Underpaid and Who Is Overpaid?

- The concepts of underpayment and overpayment have to do with the social goal of producing goods in the least-costly way - **comparison with market-clearing wage**
- **Above-Market Wages**
  - Overpaid workers - Workers whose wages are higher than the market-clearing wage for their job – two implications:
    - Employers are paying more than necessary: ($W_H > W_e$)
    - More workers want jobs than they can find: $Y > V \rightarrow ESL$
  - **Wage reduction to market clearing would be Pareto-improving**

Applications of the Theory: Who is Underpaid and who is Overpaid

Figure 2.17 Effects of an Above-Market Wage



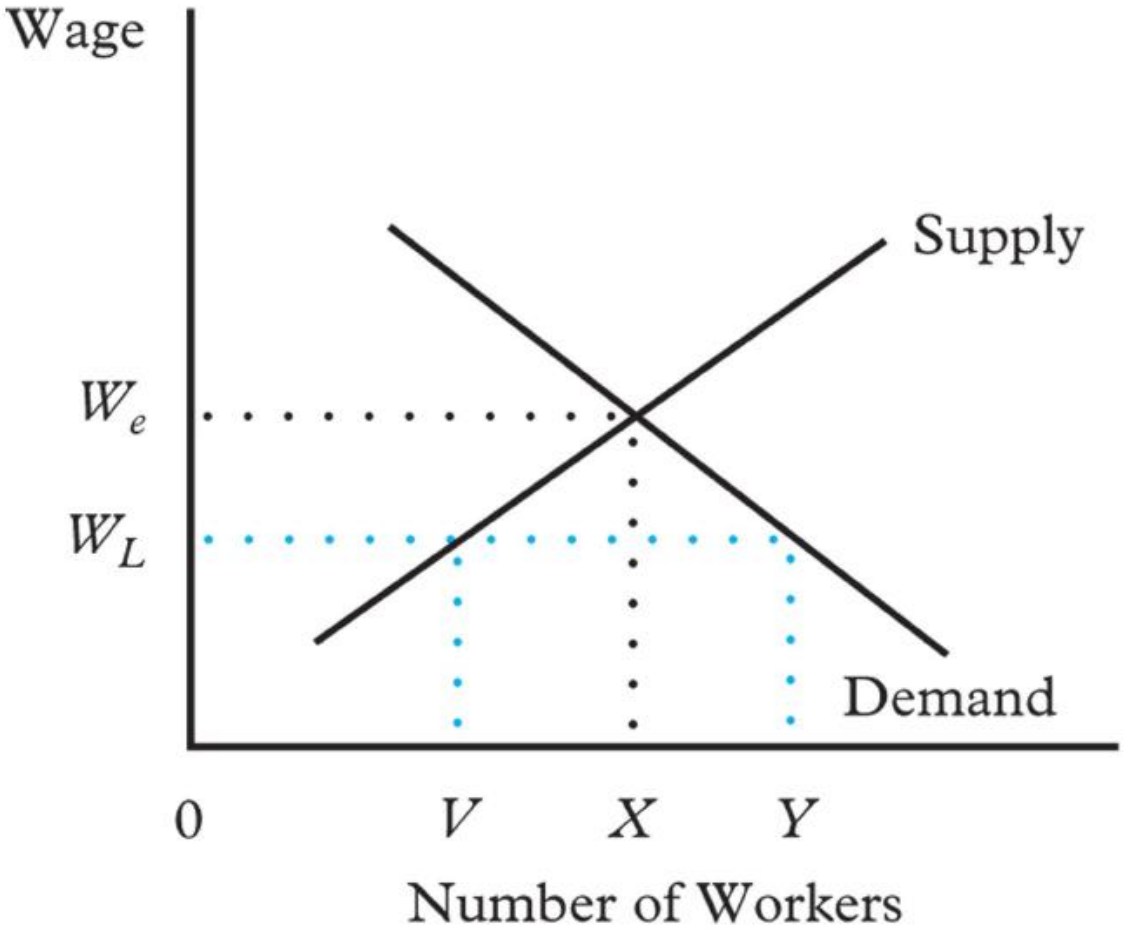
Applications of the Theory: Who is Underpaid and who is Overpaid

Below-Market Wages

- **Under paid workers - Employees whose wages are below market-clearing levels:**
  - **Employers face labour shortages due to $W_L < W_e$**
  - **It will be difficult for employers to find and keep workers, and those who remain will be dissatisfied and resentful - production of goods and services will be affected**

Applications of the Theory: Who is Underpaid and who is Overpaid

Figure 2.18 Effects of a Below-Equilibrium Wage

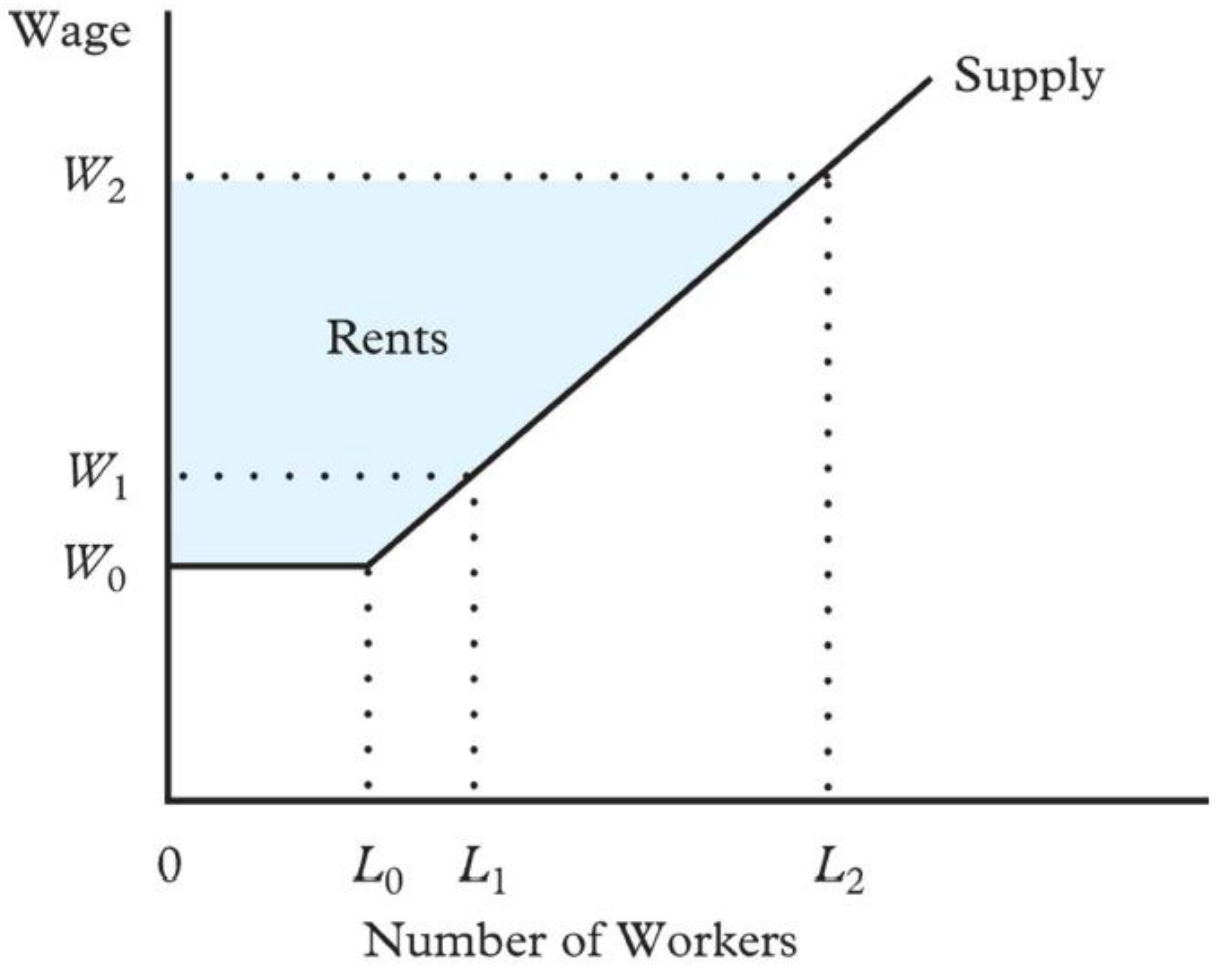


Applications of the Theory

2) Economic Rents

- For each worker, the **economic rent** is the difference between the wage received on a job and his reservation wage
- **Reservation wage** – the level of wage under which the worker refuse or quit the job - Opportunity cost to the worker for giving up hours of leisure for market work
- **Economic rents:** sum the area between the market-clearing wage and the labour supply curve
- The **labour supply curve** to an occupation or industry **is a schedule of reservation wages** – each worker potentially has a different reservation wage - rents will differ for each – **those with lower reservation wages receive a greater rent**
- Would be efficient to **reduce wage for each employee till his reservation wage** - difficult to implement

Applications of the Theory: Economic rents



Applications of the Theory

3) Unemployment and Responses to Technological Change Across Countries

- The **strength of nonmarket forces** (government programs, laws, customs or institutions (e.g. labour unions)) **varies across countries**
- If **wages above market clearing level, unemployment will result**
- **Technological change reduces the demand for less skilled workers**
- **Nonmarket forces**, which can prolong the duration of unemployment, **are probably stronger in most of Europe than in North America**

Claim: Unemployment rates are much higher in most European countries because of their generous unemployment compensation programs and laws (severance pay)

Chapter 3: The demand for labour and labour elasticities

Chapter Outline

Profit Maximization

- Marginal Income from an Additional Unit of Input
- Marginal Expense of an Added Input

The Short-Run Demand for Labour when both Product and Labour Markets are Competitive

- A Critical Assumption: Declining MPL
- From Profit Maximization to Labour Demand

The Demand for Labour in Competitive Markets when Other Inputs can be Varied

- Labour Demand in the Long Run
- More than Two Inputs

Labour Demand when the Product Market is not Competitive

- Maximizing Monopoly Profits
- Do Monopolies Pay Higher Wages?

Policy Application: The Labour Market Effects of Employer Payroll Taxes and Wage Subsidies

- Who Bears the Burden of a Payroll Tax?
- Employment Subsidies as a Device to Help the Poor

Labour demand

The **demand for labour is a derived demand** – workers are hired for the contribution they can make toward producing some good or service

Wages, employee benefits, and working conditions are influenced by institutions: minimum wage laws, pension regulations, restrictions on firing, safety requirements, immigration controls, unemployment benefits – most of these increase costs of hiring more than the help provided to workers by the regulations

Understanding the characteristics of labour demand curves **crucial for those interested in public policy**

Profit Maximization

Firms maximize profit

The profit maximizing decisions mainly involve the question of *whether* and *how* to increase or decrease output, for product and inputs price-taking firm,

The firm is continuously searching for profit improving possibilities - it must explore marginal changes almost daily

- Incrementally decide on its optimal level of output by:
  - $Q\uparrow$ when $MR>MC$
  - $Q\downarrow$ when $MR<MC$
  - Q is profit maximizing or loss minimizing when $MR=MC$
- Expand or contract output only by altering inputs
  - Use more of an input if *MRP* (additional income) > *MEI* (additional expense)
  - Reduce if its $MRP<MEI$
  - No further changes in an input if $MRP=MEI$

Profit Maximization

Marginal Income from an Additional Unit of Input

- Labour (L) and capital (K) are needed to produce output (Q):

$$Q = f(L, K)$$

- Marginal Product
  - Marginal product of labour: $MP_L = \Delta Q/\Delta L|_{K \text{ constant}}$
  - Marginal product of capital: $MP_K = \Delta Q/\Delta K|_{L \text{ constant}}$
- Marginal Revenue
  - In perfectly competitive product market: $MR = AR = P$
  - In imperfectly competitive product market: $MR < AR = P$

Profit Maximization

Marginal Revenue Product – the additional revenue arising from using an additional unit of input

- **Marginal revenue product of *L*: $MRP_L = MP_L \cdot MR$**

  (If market competitive $MRP_L = MP_L \cdot P$)
- **Marginal revenue product of *K*: $MRP_K = MP_K \cdot MR$**

  (If market competitive $MRP_K = MP_K \cdot P$)

Profit Maximization

Marginal Expense of an Added Input

- Marginal expense of labour (ME_L) is the change in total labour cost for each additional unit of labour hired
  - If the labour market is competitive: $ME_L = W$ → horizontal supply curve
- Marginal expense of capital (ME_k) is the change in total capital cost for each additional unit of capital
  - If the capital market is competitive: $ME_K = C$

The Short-Run Demand for Labour when both Product and Labour Markets are Competitive

In the short-run the stock of capital is given

The production function becomes:

$$Q = f(L, \overline{K})$$

- The firm needs only to decide ***whether*** to alter its output level
- ***How*** is not an issue because only *L* can be adjusted

The Short-Run Demand for Labour When Both Product and Labour Markets are Competitive

A Critical Assumption: Declining MP_L – diminishing marginal returns

- ***K*** **is constant - adding extra units of** ***L*** **increases output –** MP_L **is positive to some point**
- **Eventually, adding more** ***L*** **will produce progressively smaller increments of output – law of diminishing marginal returns**
- ***Why?*** **Each additional worker has a smaller share of capital stock to work with**

The Short-Run Demand for Labour when both Product and Labour Markets are Competitive

The Marginal Product of Labor in a Hypothetical Car Dealership (Capital Held Constant)

Number of Salespersons	Total Cars Sold	Marginal Product of Labor
0	0	
		10
1	10	
		11
2	21	
		5
3	26	
		3
4	29	

The Short-Run Demand for Labour when both Product and Labour Markets are Competitive

From Profit Maximization to Labour Demand

- Profits are maximized only when employment is such that any further one-unit change in labour would have a marginal revenue product equal to marginal expense:

$$MRP_L = ME_L$$

- In competitive product and labour markets:

$$MP_L \cdot P = W \text{ – in monetary terms}$$

$$MP_L = W/P \text{ – in physical quantities}$$

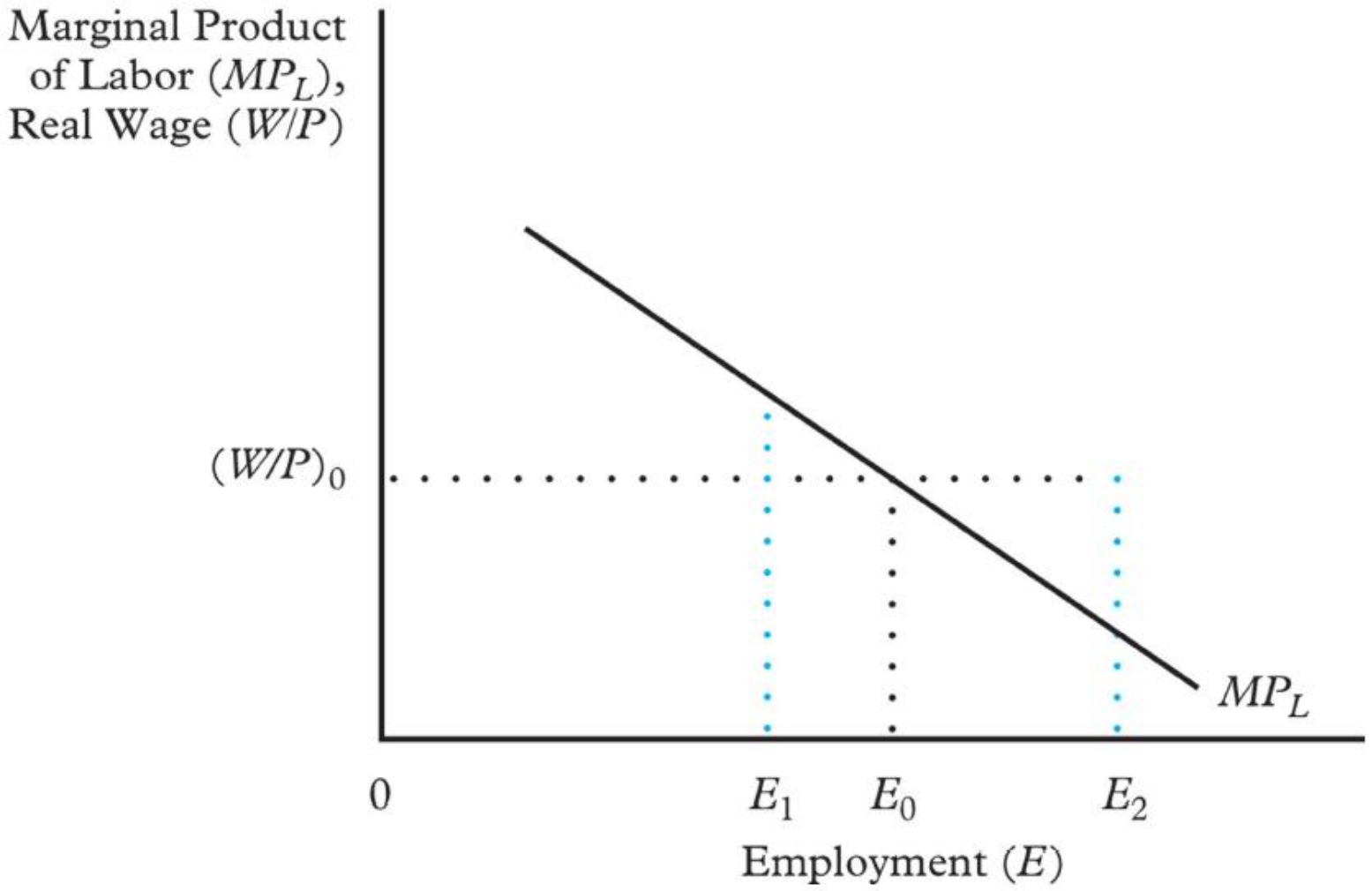
The Short-Run Demand for Labour When Both Product and Labour Markets Are Competitive

Labour Demand in Terms of Real Wages

- **Negative slope of the labour demand curve** indicates that each additional unit of labour produces a progressively smaller increment in output
- At any real wage determined by the market, **the firm should employ labour up to MP_L equals the real wage (W/P)** – the firm's demand for labour in the short-run is equivalent to the segment of its MP_L schedule:
  - At E_0 employment level: $MP_L = W/P \rightarrow$ profit maximizing level of employment
  - At E_1 employment level: $MP_L > W/P \rightarrow$ employment level E_1 is less than E_0 - firm could increase profit by adding L
  - At E_2 employment level: $MP_L < W/P \rightarrow$ employment level E_2 is greater than E_0 - firm could increase profit by decreasing L

The profit maximizing level of employment lies in the range where MP_L is declining - otherwise adding an extra unit of labour would increase profits

The Short-Run Demand for Labour when both Product and Labour Markets are Competitive



The Short-Run Demand for Labour when both Product and Labour Markets are Competitive

Labour Demand in Terms of Money Wages

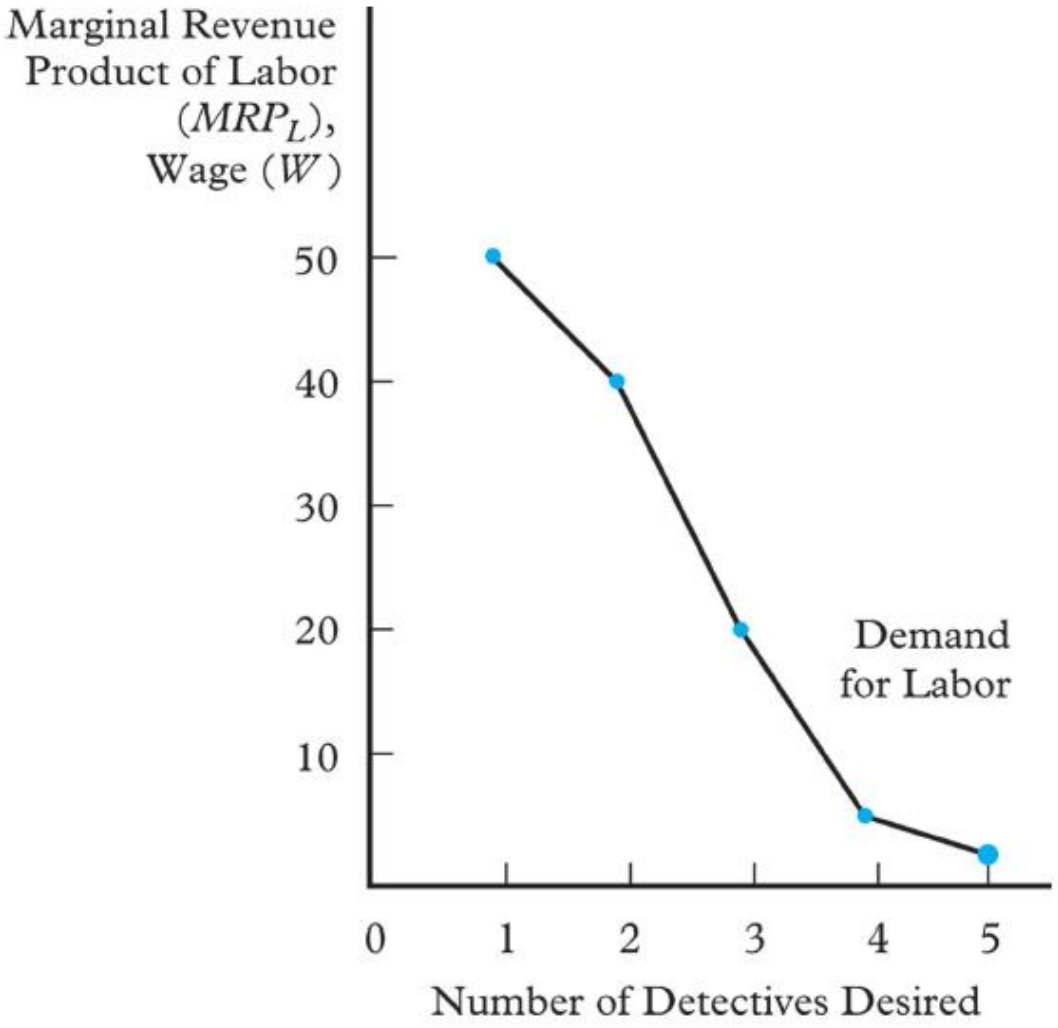
- **Labour demand curves** can be conceptualized as downward-sloping functions of money wages
- **MRP_L declines (slopes downward) because capital stock is fixed**
- **The labour demand curve slopes downward because it is the MRP_L curve.**
- **Because $MRP_L = W$ for a profit maximizer, the MRP_L curve and labour demand curve (MP_L) must be the same**
- **The marginal product of an individual is not a function solely of his or her personal characteristics - It depends also on the number of similar employees hired and the capital stock**

The Short-Run Demand for Labour when both Product and Labour Markets are Competitive

Hypothetical Schedule of Marginal Revenue Productivity of Labor for Store Detectives

Number of Detectives on Duty during Each Hour Store Is Open	Total Value of Thefts Prevented per Hour	Marginal Value of Thefts Prevented per Hour (MRP_L)
0	$ 0	$—
1	$ 50	$50
2	$ 90	$40
3	$110	$20
4	$115	$ 5
5	$117	$ 2

The Short-Run Demand for Labour when both Product and Labour Markets are Competitive



The Short-Run Demand for Labour when both Product and Labour Markets are Competitive

Market Demand Curves

- The summation of the labour demanded by all firms in a particular labour market at each level of the real wage
- They will also be downward sloping

The Short-Run Demand for Labour when both Product and Labour Markets are Competitive

Objections to the Marginal Productivity Theory of Demand

- Doubts about **whether employers consider MRP_L** – a theoretical concept, which assumes a sophistication that most employers do not have – even difficult to measure the output of individual workers
  Answer: even if not measured it is intuited

- With **fixed capital stock, it seems that adding labour would not add to output at all**
  Answer: but workers can take their turns in using the fixed capital stock such that labour will generally have a marginal product greater than zero

The Demand for Labour in Competitive Markets when Other Inputs can be Varied

Labour Demand in the Long Run

- In the long-run, the firm's ability to adjust other inputs such as capital will affect the demand for labour

- To maximize profits in the long-run, the firm must adjust *L* and *K* such that each input's *MRP* is equal to its *ME*

$$MP_L.P = W$$
$$MP_K.P = C$$

Rearranging:

$$P = W/MP_L$$
$$P = C/MP_K$$
$$W/MP_L = C/MP_K$$

The Demand for Labour in Competitive Markets when Other Inputs can be Varied

Labour Demand in the Long Run

- W/MP_L is the marginal cost (*MC*) of producing an added unit of output when using labour
- C/MP_K is the marginal cost (*MC*) of producing an extra unit of output when using capital

To maximize profits, the firm must adjust its labour and capital inputs so that the marginal cost of producing an added unit of output using labour is equal to the marginal cost of producing an added unit of output using capital

The Demand for Labour in Competitive Markets when other Inputs can be Varied

Labour Demand in the Long Run

- Given $^{W}/_{MP_L} = {}^{C}/_{MP_K}$, if *W* increases:
  - The firm will want to cut back on *L*, which will raise its MP_L

  Each unit *K* has less *L* working with it, therefore, MP_K falls, and the firm's profit-maximizing output will fall – **scale effect**

- Adjustment
  - If $^{W}/_{MP_L} > {}^{C}/_{MP_K}$ *L*↓ given an ↑*W*, the MP_L↑ and the ↓MP_K will adjust to restore $^{W}/_{MP_L} = {}^{C}/_{MP_K}$

  The rise in *W* can also cause the firm to change its input mix by substituting capital for labour in the long run – **substitution effect**

The Demand for Labour in Competitive Markets when other Inputs can be Varied

Labour Demand in the Long Run

- Increase in *W* will cause the firm to reduce employment for two reasons:
  - The desired level of output decreases – scale effect
  - The firm substitutes capital for labour – substitution effect

  (effect on K is ambiguous but the demand for labour is reduced)

- More than two Inputs
  - Labour can be subdivided – by age, education, occupation
  - Other inputs: materials and energy
  - For all other inputs the equality of MC in using these inputs to produce an added unit applies

The Demand for Labour in Competitive Markets when other Inputs can be Varied

If Inputs are Substitutes in Production

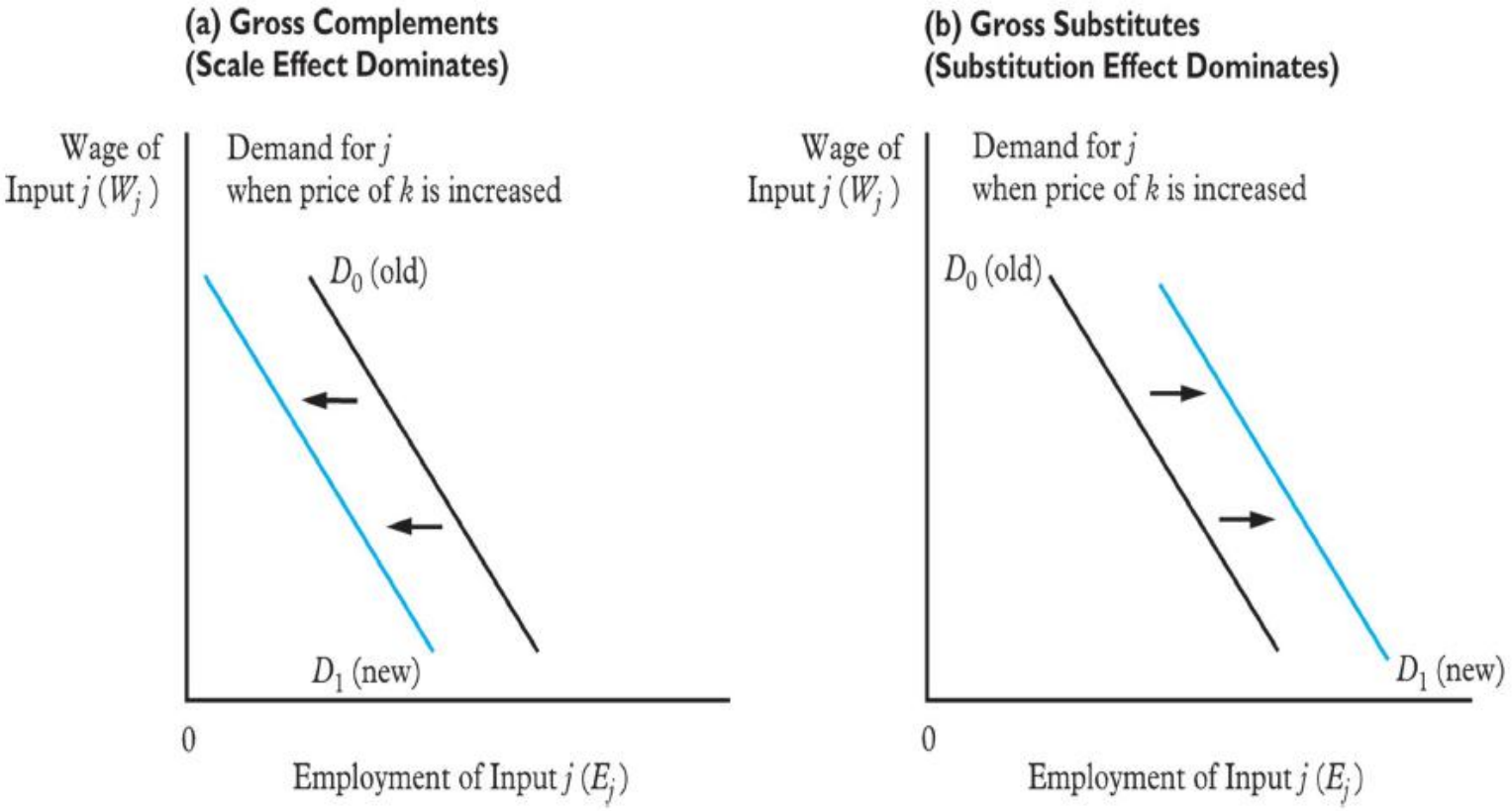
- If two inputs are substitutes in production, an increase in the price of other input may change the demand for a given input either to the left or to the right depending on the relative strength of the substitution and scale effects
  - If an increase in the price of one input shifts the demand for another input to the left, then the scale effect dominates the substitution effect – inputs are gross complements
  - If the increase in the price of one input shifts the demand for the other input to the right, then the substitution effect dominates – inputs are gross substitutes

If Inputs are Complements in Production

- When two inputs must be used together in some proportion – no substitution effect, only scale effect

The Demand for Labour in Competitive Markets when other Inputs can be Varied

Figure 3.3 Effect of Increase in the Price of One Input (k) on Demand for Another Input (j), Where Inputs Are Substitutes in Production



Labour Demand when the Product Market is not Competitive

Monopoly producers are price-makers in the product market but wage-takers in the labour market

They use $MRP_L = ME_L$ to determine the profit-maximizing level of employment

Maximizing Monopoly Profits

- The marginal revenue from an extra unit of output is less than P – to expand production price has to fall
- To maximize monopoly profits a monopolist will hire until:

$$MRP_L = MR \,.\, MP_L = W$$

Dividing both sides by P (recall that P > MR) yields:

$$MR/P \,.\, MP_L = W/P$$

Since $MR<P$, $MR/P<1$ – the labour demand lies below the labour demand of a comparable firm in a competitive product market – even if employment different, wages are not necessarily different

Labour Demand when the Product Market is not Competitive

Do Monopolies Pay Higher Wages?

- Economists suspect that product-market monopolies pay wages that are higher than what a competitive firm would pay because they can pass the costs along to consumers in the form of higher prices

- The ability to pay higher wages makes it possible for managers to hire people who might be more productive

Policy Application: The Labour Market Effects of Employer Payroll Taxes

Governments finance certain social programs through taxes – payroll taxes –that require employers to remit payments based on their total payroll costs

- Payroll taxes finance government programs such as:
  - Unemployment insurance
  - Social Security retirement
  - Disability
  - Medicare/Medicaid

Who Bears the Burden of a Payroll Tax?

- Let *X* be the fixed amount of tax per labour hour (rather than a percentage of payroll)

Policy Application: The Labour Market Effects of Employer Payroll Taxes

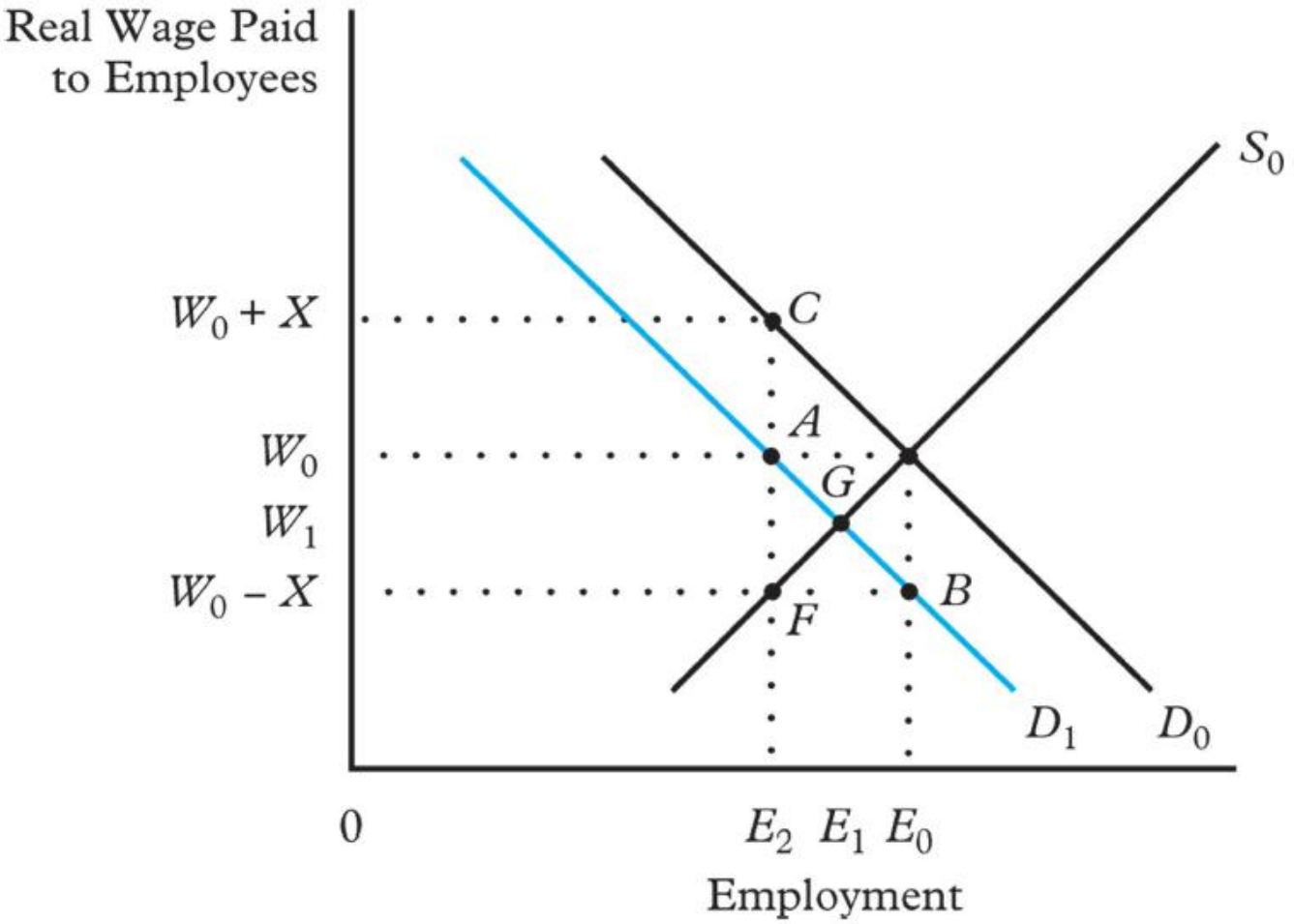
Shifting the Demand Curve

- Payroll taxes will shift the labour demand curve to the left
- Employers will decrease their employment if their wage bill increase by the tax amount - $W + X$
- Employers will retain the same amount of workers if the entire tax burden is passed onto the workers, i.e., workers' wages fall by the tax amount of X: $W - X$

Employees bear a burden in the form of lower wage rates and lower employment levels when the government chooses to generate revenues through a payroll tax on employers

Policy Application: The Labour Market Effects of Employer Payroll Taxes

Figure 3.4 The Market Demand Curve and Effects of an Employer-Financed Payroll Tax



Policy Application: The Labour Market Effects of Employer Payroll Taxes

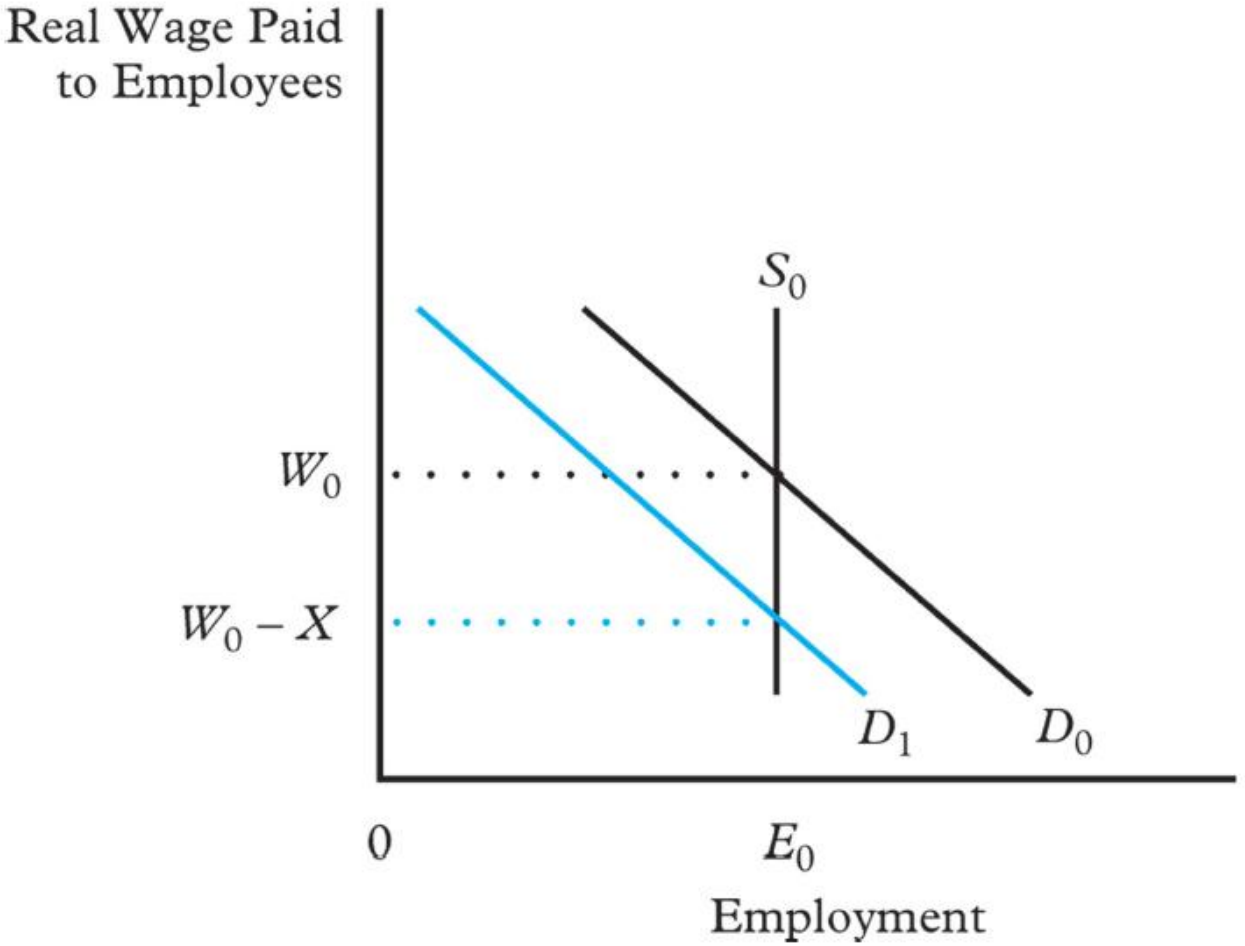
Effects on Labor Supply Curves

- If the labour supply curve were vertical, the entire amount of the tax would be shifted to workers in the form of a decrease in their wages by the amount of X: $W - X$

The less responsive the labour supply is to changes in wages the more the tax gets shifted to the workers in the form of wage decrease

Policy Application: The Labour Market Effects of Employer Payroll Taxes

Figure 3.5 Payroll Tax with a Vertical Supply Curve



Policy Application: The Labour Market Effects of Employer Payroll Taxes

Overall

- The incidence of tax burden on employers and employees depends on the responsiveness (elasticities) of labour demand and labour supply to changes in wages
- If wages do not fall due to an employer payroll-tax increase, employment will, and employer labour costs will increase thus reducing the quantity of labour demanded

Empirical studies suggest that most payroll tax is shifted to wages and only a little long run effect on employment

Policy Application: The Labour Market Effects of Wage Subsidies

Employment Subsidies as a Device to Help the Poor

- Government subsidies of employers' payroll could be:
  - Cash payments
  - Tax credit to employers – Target Job Tax Credit (TJTC), 1979-1995
  - General or selective/targeted
- Let *X* be the fixed amount of subsidy per labour hour
- Subsidies shift the labour demand curve to the right, thus creating pressures to increase employment and the wages

Empirical studies suggest that subsidies targeting the disadvantaged have not been very effective in increasing employment. General hiring subsidies intended to counteract job losses during recessions seem to have been more effective