The Labour Market (by Ling)

Overview	
The Production Function	• Showing the relationship between input and output through a function
The Demand for Labour	• Profit maximising firm determine the demand for labour when benefit (marginal product of labour) equals to cost (wage)
The Supply of Labour	• Utility maximising consumer/worker determine the supply for labour when benefit (wage, therefor consumption) equals to the cost (leisure time)
Labour Market Equilibrium	• Equilibrium is reached when labour demand equals to supply
Employment Status and Unemployment	• Consist of employed, unemployed and out of labour force

	Definitions	***Formula***
The Production Function		
Production Function	An equation showing the relationship between input and output	$\underset{Y}{real\ output} = \underset{A}{total\ factor\ productivity} \times \underset{F(K,N)}{function}$
Total factor productivity	Measures the effectiveness with which capital and labour are used	Includes all inputs, except for capital and labour, including technology/management and others like raw materials, land, energy
Marginal Product	The increment in output with an additional unit of input	Marginal Product is positive, meaning additional input creates additional output. However, Production Function exhibits diminishing marginal product, meaning marginal product increase at an decreasing rate
Supply Shocks/ Productivity Shock	Affect the amount of output that can be produced for a given amount of input Affecting Total factor productivity	Either a negative/adverse or positive/beneficial shock
Return to Scale	The change in output after scaling all the inputs by the same factor	Decreasing RTS: $Y_2 < zY_1$; Constant RTS: $Y_2 = zY_1$; Increasing RTS: $Y_2 > zY_1$
Labour Market		
Demand for Labour	Determine by profit maximising firm	$\max_{N_1} \pi = AF(K, N_1) - wN_1$
Supply of Labour	Determine by utility maximising consumer/worker	$\max_{c,l} U = u(c, l)$
Time constraint	Constraint faced by any consumer/worker	$\underset{c}{consumption} = \underset{w}{real\ wage} \times (\underset{h}{total\ time} - \underset{l}{leisure})$
Consumer Preference	An indifference curve shows all combinations of leisure and consumption that make the consumer equally happy	
Marginal rate of substitution	The amount of consumption the consumer would be willing to substitute for one unit of leisure	$MRS = -\frac{\Delta c}{\Delta l}, given\ U = \overline{U}$ $MRS = \frac{MU_l}{MU_c}$
Aggregate Labour Supply	Although there is a conflicting outcome in leisure, empirical evidence suggest an upward trend between increased wage and labour supply	
Labour Market Equilibrium	Equilibrium is reached when labour supply equals to demand, at full-employment level with market-clearing real wage	In the classical model, real wage adjusts quickly and there cannot be involuntary unemployment. However, in new Keynesian model, labour market might not adjust real wage quickly
Employment Status and Unemployment		
Full-Employment/ Potential Output	The level of output that firms supply when wages and prices have fully adjusted	$\overline{Y} = AF(K, \overline{N})$
Employment Status	Consist of three categories: Employed, Unemployed, Not in labour force	Labour force: Employed + Unemployed Unemployment rate: unemployed/labour force Participation rate: labour force/adult population

Graphs & max/min problems

Production Function

Solve for

- Showing relationship between capital/labour and output

Parameters

- Production Function

$$Y = AF(K, N)$$

Intuition

- Output increase at an decreasing rate as input increases

Math

$$\frac{\partial Y}{\partial A} = MPA > 0; \frac{\partial Y}{\partial K} = MPK > 0; \frac{\partial Y}{\partial N} = MPN > 0$$

Solve through first order derivative

$$\frac{\partial Y^2}{\partial^2 A} < 0; \frac{\partial Y^2}{\partial^2 K} < 0; \frac{\partial Y^2}{\partial^2 N} < 0$$

Diminishing marginal returns

Y vs K/N Graphs

	slope	y-intercept	x-intercept
Production Function	Marginal Product	0	0

	Increase	Decrease
Productivity Shock A	Marginal Product ↑	Marginal Product ↓

Graphs & max/min problems

Demand for Labour

Solve for	• Determinants of optimal demand of labour by a profit-maximizing firm
Parameters	• Profit maximising condition $$\max_{N_1} \pi = AF(K, N_1) - wN_1$$
Intuition	• A rational firm chooses the optimal level of input to maximise profit, considering the cost involved
Math	considering $\frac{d\pi}{dN_1} = 0$ Solve through first order derivatives common identity: $\frac{d\pi}{dN_1} = MPN_1 - w_1;$

	slope	y-intercept	x-intercept
MPN	MPN'	MPN when N=0	–

	Increase	Decrease
Productivity shocks A	MPN ↑ N ↑	MPN ↓ N ↓
Size of capital K	MPN ↑ N ↑	MPN ↓ N ↓

w vs N Graphs

Graphs & max/min problems

Supply of Labour

Solve for

- Determine optimal labour supply by rational utility maximising consumer/worker

Parameters

- Utility maximising condition

$$\max_{c,l} U = u(c, l)$$

- s.t. $c = w(h - l)$

Intuition

- A rational utility maximising consumer chooses to balance consumption and leisure, two things that can increase the utility for that individual, given the time constraint

Math

Solve through first order derivatives and Lagrange method

Common identity

$$\frac{\partial U}{\partial l} / \frac{\partial U}{\partial c} = \frac{dc}{dl} = w$$

	slope	y-intercept	x-intercept
Indifference Curve	$-MRS$	MPN when N=0	–
Budget Line	-w	wh	h

	Increase	Decrease
Wealth	labour supply ↓	labour supply ↑
Expected future real wage	labour supply ↓	labour supply ↑
Size of working age population	labour supply ↑	labour supply ↓
Labour force participation rate	labour supply ↑	labour supply ↓

consumption vs leisure Graphs

Increase wage	Consumption	Leisure
Substitution Effect	↑	↓
Income Effect	↑	↑
Net Effect	↑	uncertain

Decrease wage	Consumption	Leisure
Substitution Effect	↓	↑
Income Effect	↓	↓
Net Effect	↓	uncertain

Substitution Effect vs Income Effect