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# UNIT 12 REAL BUSINESS CYCLES

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## 12.0 OBJECTIVES

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After going through this Unit you should be in a position to:

- explain the underlying ideas behind real business cycles theory;
- appreciate the importance of technological innovation; and
- appreciate the possibility of economic fluctuations due to supply shocks.

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## 12.1 INTRODUCTION

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The extent of this module is partly indicated in the title. It is about real business cycle (RBC) theory. In addition, it exposes you to New Classical Business Cycle theory, a specie which belongs to the same genus that spawns the RBC approach. The literature in the field is technical, so we will work through some elementary, but not trivial, treatments of the subject and strongly recommend plunging into the classics in the area, once some quantitative skills have been imbibed.

The present Unit connects, as promised and naturally, from the study of business cycles in the previous Unit. Intimately, however, the springs of this Unit are less cycles as developed there and your exposure to the traditional theory of unemployment, and more your education in microeconomics that ends with the theory of general equilibrium. The perspective of the former is that business cycles emerge naturally in the evolution of a capitalist economy as a system. Particularly, the connection between the short-run dynamics of traditional theories of employment and the cycles that emerge from their long-run extension would be written along aggregative lines. The painstaking work of pioneers like Wesley Clair Mitchell and others consisted in closely scrutinising the time series of important macroeconomic magnitudes and tracing short and long cycles therein. The strategy of the latter, on the other hand, is to develop the story of market-clearing over time to account for the phenomenon of fluctuations and cycles. A distinction is made between the two notions. Fluctuations might not present the periodicity indicated in the word 'cycles'. Real business cycles are fluctuations generated by shocks which might not reflect the rhythms of ebb and flow of classical cycles. New Classical Business Cycle research, on the other hand, is oriented towards explaining the familiar pattern of boom and slump, one following the other in regular succession. Perhaps for this reason, the role of money and finance in both approaches might be distinguished. In the former, the shocks referred to are changes in technology and tastes. Money is a veil. On the other

hand, money and finance are part of the model of expansion and contraction developed by New Classical Business Cycle theorists.

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## 12.2 NEW CLASSICAL BUSINESS CYCLE THEORY

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As mentioned earlier, the following exposition follows the elementary account in the book:

Yang, Xiaokai, *Economics: New Classical versus Neoclassical Frameworks*, Oxford: Blackwell Publishers. The book goes on to rigorously develop some models and you are encouraged to follow them up.

One reason for natural unemployment in a new classical general equilibrium model is changes in the structure of the division of labour (A brief idea about new classical economics was given in Unit 1. Their views about unemployment will be discussed in Block 6). Consider an economy with  $m$  consumer goods and  $n$  traded goods. Of these goods, suppose the price of oil rises. The equilibrium values of  $m$  and  $n$  changes. The demand for luxury sedans, say, might vanish as people stop consuming inessentials. The producers of those goods will be unemployed. They are free to move to sectors which do not face an impact of this exogenous shock. However, since there is considerable educational capital that has been invested in mastering the nuances of limousine manufacture and the costs of moving are invariably high, these individuals will not be immediately productive as the correspondingly skilled workers in the other sectors. In other words, an economy with a division of labour into specialists will face the phenomenon of unemployment. In fact the two are connected in a relationship: the more elaborate the division of labour, the greater will be the level of unemployment as a response to shocks from without. The situation would not occur in autarky. Since each individual consumes what she produces, any stochastic shocks will be accommodated by an optimal reallocation across the spectrum of goods consumed.

Some features distinguish New Classical features of business cycles from other forms of business cycle. The extent of the division of labour and the level of specialisation for each individual are grounded in dynamic microeconomic choices. The model generates persistent, regular, endogenous, and efficient business cycles. It also simultaneously generates endogenous, and efficient, unemployment. The model is consistent with empirical phenomena like the fact that the output of durables fluctuates more than the output of nondurables.

One insight is that the business cycle is inextricably linked with trade and financial openness. In its modern form it is exemplified in developed economies with a complex division of labour and high productivity. Let us consider an economy that consists of many agents. Each individual can produce a perishable good called corn and a durable good called tractors. A tractor is indivisible and each driver can drive only one tractor as a capital input in the production of food at any point of time. Each job is skill-specific and two types of cost will be incurred if an individual shifts between activities. There is obsolescence of knowledge and memories will decay when an individual moves from one activity to the other. There is also an entry cost, a nontrivial investment in education that an individual has to incur before she enters any activity. A tractor has a life of two years. Each individual's utility function is defined over consumption (food) and the objective is to maximise the present value of total utility.

At least three possible equilibrium situations follow. The first is autarky. Each individual divides her time between manufacturing a tractor and using it to produce food in the first year, and produces only food in the second year. This structure is cycle-free. Yet, such an economy cannot garner Smithian gains from the division of labour. The second structure is one in which the division of labour is fully accomplished. The population is divided between producers of food and producers of

capital goods. In each year, professionals drive tractors to produce food. The producers of tractors manufacture them in the first year and are unemployed in the next. Total output in the first year is higher than the second. Thus, we see a business cycle of two years with unemployment in the second year. Learning by doing is maximal here and the society is best poised for the accumulation of human capital. The third structure is partial division of labour. Here, producers of tractors move to the production of food in the second year. Thus, farmers are completely specialised and can reap those economies whereas producers of tractors are not.

In the second structure, producers of tractors sell tractors and buy food in odd years. The value of tractors sold must be in excess of the value of food that is produced. The difference is required as a wherewithal for tractor specialists to buy food in even years when they are unemployed. Since corn is perishable and tractor producers face the problem of the double coincidence of wants in even years, the institution of fiat or credit money is indispensable for exchange to take place. Since the discounted optimisation problem is carried out for a representative agent, the present value of real income between farmers and manufacturers of the capital good must not be different. In the light of the earlier considerations, this means that income in the tractor goods-producing sector must be higher than the income in the corn-producing sector by an amount that compensates for unemployment in the sector producing durable goods in the recession.

It has already been indicated that the non-autarkic economies cannot operate without fiat or credit money. For example, in the second structure, farmers sell food but do not purchase goods in even years, while tractor manufacturers buy food but do not sell goods in even years. Then, tractor producers must save some of the income generated from selling their vehicles in odd years to eat in the following even years. Savings cannot be in the form of goods, so a commodity money will not solve the problem. The only redressal is the introduction of an entity outside the system that has the power to print intrinsically worthless pieces of paper whose value is determined by the price level in the process of exchange. It is equally possible for a bank to mediate between agents and across time, induced by arbitrage opportunities, offering its own 'inside' money. It can be shown that rules of allocation and even accumulation can be obeyed with these monetary arrangements. Indeed, without money the models with exchange cannot be in dynamic general equilibrium even if they are Pareto superior to autarky.

To generalise, the following elements accentuate cycles: the division of labour, the length of the roundaboutness of production, the durability of goods, the income share of durable goods, the costs of moving between jobs, transaction costs, and the degree of learning by doing. Correspondingly, countercyclical factors are: a decrease in the roundaboutness of production, a decrease in the level of the division of labour, a decrease in the durability of goods, decreases in transaction costs and a decrease in the degree of learning by doing.

**Check Your Progress 1**

- 1) Explain the basic tenets of the new classical business cycle theory. What are the factors that accentuate cycles?

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## 12.3 REAL BUSINESS CYCLE THEORY

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The parable that motivates this discussion originated with Edmund Phelps and invites you to think that all men (and women) are islands. They have perfect information about the prices of goods and services on their islands but cannot sample the prices on other islands except by rowing there, a costly activity. Consequently, they can only form estimates of the general price level, the average of all prices. Thus, an increase in the *general* price level will be misperceived as an increase in the price of goods on the island, a (small) subset and, therefore, sub optimal decisions about consumption, production, and investment will be taken. In the spirit of the earlier section, the following account in the next is drawn from the book:

Barro, Robert, *Macroeconomics*, New York: John Wiley & Sons, Inc.

### 12.3.1 An Island Economy

Consider an economy as a sea with islands of local markets. Each household produces goods and sells them on one and only one of the arrays of these markets. Goods differ according to location, physical characteristics, and so on. Accordingly, we index goods by the symbol  $z$ , where  $z = 1, 2, \dots, n$ . The index might specify a location or be associated with an assemblage of characteristics of goods, methods of production etc.  $p_t(z)$  is the price of a good or, indeed, a basket of commodities of type  $z$  during period  $t$ . Thus, the RELATIVE PRICE  $p_t(z)/p_t(z')$  is the price of commodities of type or location  $z$  relative to commodities of type or location  $z'$ . Distinct is the GENERAL PRICE LEVEL  $p_t$  which is the average of the prices in the islands at date  $t$ . If  $p_t(z) > p_t$ , then locale  $z$  appears relatively attractive to sellers in the given period. There will be a rush of productive resources from other employments to island  $z$ . The increased supply of goods in our market will, in the familiar manner, drive down the local price to the average price. Similar reasoning applies to a case when the price of the commodity/at the location  $z$  is less than the general price level. Assuming freedom of entry and exit, the average of all prices will be an efficient estimator of the local price.

At the beginning of period  $t$ , a producer in market  $z$  has a stock of capital  $k_{t-1}(z)$ . Assuming a production function  $f$  with standard properties, the quantum of goods produced is given by  $y_t(z) = f(k_{t-1}(z), l_t(z))$ . Total revenue earned by sellers from sales is the product of this quantity with the local price. However, people typically shop at different locations and the variable of interest to them will be  $p_t$ , the index of generalized purchasing power. In that case, people will calculate the real value of the revenue from production which is  $(p_t(z)/p_t) \cdot f(k_{t-1}(z), l_t(z))$ .

Thus, an increase in the relative price above, physical output remaining constant, means a greater value of sales. From the perspective of a producer, this increase is no different from a corresponding upward shift in the production function. Earlier, when deciding how much to work and produce, workers and producers looked at the physical marginal product of labour. Now, in order to calculate the effect on real sales revenue, producers multiply that number by the relative price to get the real value of the marginal product of labour. Then, as earlier, a shift in one component of the product, the relative price, appears identical to a proportional shift in labour's physical marginal product schedule. Consequently, producers respond in the familiar fashion.

Coming to the inducement to invest, the amount of investment is determined by the marginal product of capital. However, the marginal product of this factor determines the flow of next period's output as a result of an increase in this period's capital stock. According to the standard definition, it takes one period for investment to raise productive capacity. Thus, the real value of capital's marginal product which

determines investment decisions is defined as the product of this period's marginal product and next period's relative price  $p_{t+1}(z)/p_{t+1}$ .

How would producers respond to a rise in  $p_t(z)/p_t$ ? There are two possibilities. This hike is temporary and confined to the present period. In other words, people do not expect a similar increase in the future. Then, as discussed earlier, the change is tantamount to an upward shift in the schedule of labour's marginal product in  $t$  but not in later periods. Two kinds of substitution effects are implied. In the first case, within the time period, there is a movement away from leisure and towards consumption. In addition, there is also an intertemporal substitution effect in a shift away from today's leisure and towards tomorrow's leisure. The second effect suggest that the impact on current work and production will be strong.

A second possibility attendant on a high relative price today is an increase in the expected relative price  $p_{t+1}(z)/p_{t+1}$ . In that case, there is a positive effect on investment today. Producers will purchase additional capital from other markets in order to capitalise on the higher relative price for goods sold later in location  $z$ . The first impulse would be an increase in the demand for local resources in market  $z$  albeit at the high current relative price. Apart from the technical assumption that goods and services on hand tend to be needed first, the high prospective relative price tomorrow can induce investors to spend at a high relative price today. A high prospective relative price means that the high current relative price is no more an opportunity to reap present rewards. The intertemporal substitution effects referred to will become weak. In other words, there might be a negligible response on work effort and the supply of goods today.

A high relative price cannot persist. The increased investment that results increases productive capacity in that market. The augmented supply of goods in future will exert downward pressure on future relative prices. Thus, the high relative price must persist long enough to generate positive effects on investment. If not, the intertemporal substitution effect will remain strong. We regard the nominal interest rate as a system-wide variable determined on a centralised credit market. Correspondingly, the real interest rate  $r_t$  is an economy-wide variable as well. Buyers who visit island  $z$  will be deterred in their consumption  $c_t^d(z)$  and investment demands  $i_t^d(z)$  by a high relative price. Given the latter, a high real interest rate means a greater supply of goods to market  $z$  but reduced demands for consumables and investment goods there. Clearing of the local market is given by the equation:

$$Y_t^s(z)[p_t(z)/p_t, p_{t+1}(z)/p_{t+1}, r_t, \dots] = C_t^d(z)[p_t(z)/p_t, r_t, \dots] + I_t^d(z)[p_t(z)/p_t, p_{t+1}(z)/p_{t+1}, r_t, \dots]$$

### 12.3.2 Imperfect Information

Buyers and sellers are perfectly informed about the local price but must form estimates about the average of all prices. At the outset, let us assume that there is no reason for buyers and sellers in market  $z$  to believe that their local market is in any sense different from the average market anywhere. Thus, as a preliminary estimate, the local price is not assumed to be different from the expected general price level. We assume RATIONAL EXPECTATIONS in its weak form, which implies that people do not make systematic forecasting errors. In addition, we assume that the information set of all agents is identical. Thus, the PRIOR of the future general price level,  $p_t^e$ , is the same across all agents. When interval  $t$  actually unfolds, the selling price,  $p_t(z)$ , will empirically be known. It is unlikely that this price will be equal to the earlier estimate of the general price level. Since the information set has at least one additional element now, the actual local price, the estimate of the general price level can be updated with this new data. For instance, if the local price turns out to be higher than expected, it is likely that the average of all prices also exceeds the earlier

estimate. Call  $p_t^e(z)$  the EX POST price expectation, the notation signifying that this estimate differs from the prior due to an updating formula triggered by the arrival of information about the local market  $z$ . The simplest algorithm is to give a weight of  $\theta$  to the local price and, therefore, a weight  $1-\theta$  to the prior general price level in forming the new estimate of the general price level. Thus,  $p_t^e(z) = \theta p_t(z) + (1-\theta)p_t^e$ . Clearly, people will set a high value of  $\theta$  if their market differs little from other markets in price space. On the other hand, the weight on the general price level would be higher in the absence of aggregate shocks that change the general price level over time. For instance, we would attach limited credence to the general price level if the environment is buffeted by unpredictable changes in money and factors that influence the demand for money.

A person's ex post expectation of the average price level will determine her perception of her relative price. Call  $p_t(z)/p_t^e(z)$  the PERCEIVED relative price that determines demand and supply functions in market  $z$ . The interaction of both schedules determines equilibrium price and output  $p_t(z)$  and  $y_t(z)$ . Now, an increase in the PRICE RATIO  $p_t(z)/p_t^e$  leads to an increase in the perceived relative price. However, by virtue of the updating formula, the ex post price expectation rises by a fraction,  $\theta$ , of the increase in the local price. Thus, the perceived relative price rises by less than the price ratio. For example, suppose the prior expectation of the price level is 100 and  $\theta = 1/4$ . Then, if the local price is 104,  $p_t(z)/p_t^e = 1.04$ . In that case,  $p_t^e(z) = 1/4 \cdot 104 + 3/4 \cdot 100 = 101$ .

Hence,  $p_t(z)/p_t^e(z) = 104/101 \approx 1.03$ . That is to say, if the weight placed on the local price is one fourth, the perceived relative price responds by approximately twenty five percent less than the price ratio. In general, the higher is the weight, the lower is the reaction. The local market clears when the price ratio equals one. By the same token, the market-clearing perceived relative price is unity as well.

Suppose, now, there is a surprise increase in the stock of money  $M_t$ . People did not anticipate this change when they formed their priors. Suppose the local price rises in a typical market. The prior being given, the price ratio goes up. Therefore, the perceived relative price increases as well. Thus, the typical individual believes that she is operating in a market where the relative price is high. This belief is false because, by definition, the general price level is the average of the local prices across markets. However, since the average price level and the quantity of money are not elements of the information set, the representative individual underestimates the rise in the general price level/overestimates the relative price in her local market. Consequently, people increase their supplies of goods and lower their demands.

An increase in the perceived relative price raises the relative price people expect in the local market for the next period. Thus, investment demand today rises and the supply of goods falls. The demand and supply curves now combine two effects of changes in the price ratio. First, there is the effect from the current perceived relative price making the supply curve more positively sloped. Second, there are the effects from the change in the prospective relative price,  $p_{t+1}(z)/p_{t+1}^e$ , reducing the negative slope of the demand curve. Let us assume that the latter effect is stronger. The promise of favourable prospective returns far outweighs the high perceived current-relative-price, leading to aggressive expansion plans. Secondly, there are effects on the real interest rate. The supply of goods exceeds the demand in the typical market. Thus, in the aggregate, desired savings exceeds net investment demand. The expected real interest rate falls to bring the two into equality. That is, the aggregate demand curve shifts rightward and the supply curve shifts leftward. The lower expected real interest rate motivates people to consume and invest more but to work and produce less.

What is the outcome on output in the typical market? The high price ratio stimulates supply but depresses consumption and investment demand. Also, the anticipation of a high prospective relative price encourages investment but reduces the supply of present commodities. Lastly, the fall in the expected real interest rate increases investment and consumption demand but weakens supply. Then, the conclusion that output increases in the typical market depends upon the powerful positive effect of the hike in the prospective relative price on local investment demand. In that case, the monetary disturbance would stimulate local investment, output, and work effort. Since the analysis is conducted for the representative market, the general result is an increase in aggregate investment, output and work.

The steps following from the surprise increase in money and prices to increased work, output and investment are as follows. In the first place, a rise in the general price level appears no different from a rise in the relative price to suppliers in market  $z$ . They work more and increase production because they confuse a change in the general price level with a local change that would warrant an increase in activity. Secondly, the change in the price ratio makes people believe that the favourable condition in the local market will persist. They, therefore, raise their expectations of the future relative price. Once again, people are fooled into believing that there is a change in local demand and increase investment. These plans show up in the current purchase of goods and services at the local price. Despite the high relative price, investors proceed with their projects in order to avail of the expected high returns later.

The misperceptions would not arise if people had perfect information about money and prices. Suppose everyone correctly anticipates a once-and-for-all increase in the quantity of money from the last period to the present. Then the higher value of  $M_t$  today will result in a one-to-one increase in  $p_t^e$ . The actual prices and the prior expectations increase in the same proportion. There will be no effects on the supply of and demand for commodities in market  $z$  and, consequently, no effects on work and production and the real interest rate. In conclusion, fully anticipated increases in money and prices are neutral. The theory does not support the case for using monetary policy to smooth out business fluctuations.

Now, during period  $t$ , producers are unlikely to find that the actual price at which their goods sell locally equals the prior expectation  $p_t^e$ . There are two possibilities, once again. Some special reason like a shift in the demand in market  $z$  might have caused a shift in the relative price of local goods. Besides, the forecast of the general price level is unlikely to be precise. The general price level will be higher or lower than the prior expectation of its level. We continue to assume that the process of shopping is less than complete, that agents will continue to operate with data about a small sample of extant prices. When information is incomplete, the perfect information about the local price is informative about the general price level.

Suppose people predict the general price level with a high level of accuracy. The situation can be explained by the authorities pursuing a monetary policy that provides perfect stability. In other words, there would not be unpredictable shifts in the quantity of money,  $M_t$ , from period to period. Then, buyers and sellers would not need to make discontinuous adjustments to their priors when they observe the local price. They would believe that movements in  $p_t(z)$  signaled changes in  $p_t(z)/p_t$ , rather than movements in  $p_t$ . The greater the confidence in the credibility and reputation of the monetary authorities, the greater the implications of being fooled by monetary surprises. Still, by rational expectations, people infer that they are right on average. They will regard changes in  $p_t(z)$  as evidence that  $p_t(z)/p_t$  has changed. Consequently, they will substantially change their demands and supplies. In other words, a surprise increase in the money supply induces a large increase in output.

On the other hand, consider an economy in which the monetary authorities are capricious, changing the money supply widely from period to period. As a result, the general price level diverges sharply from the forecasted level. Here, people have less confidence that a change in the local price reflects a change in the relative price. They would believe that a high local price signaled a more than proportionate expected general price level. In that case,  $p_i(z)/p_i^e$  and, therefore, demands and supplies are relatively unresponsive to observed changes in the local price. In this case, a monetary surprise has small output effects. The conclusion is that the greater the volatility of the time series of money, the smaller the real effect of monetary shocks. A greater volatility of money induces agents to associate increases in local prices with surprisingly high general price levels. The authorities will find it more difficult, in these circumstances, to fool people into believing that relative prices have changed.

Fundamentally, at stake here might be the much-vaunted efficacy of the price system as the most efficient and parsimonious signaling device. A great fluctuation in money supply from one interval of time to the next means that prices become less responsive to changes in local prices. In other words, agents make fewer mistakes when price changes are a reflection of unexpected changes in money and the general price level. However, the flip side is that people make larger mistakes when relative prices change. The greater the uncertainty about money and the general price level, the less prices become useful as the conveyor of information par excellence. Thus, the economy becomes less responsive to changes in fundamentals, shifts in tastes and technology, that require optimising and efficient reallocation of resources. In conclusion, while changes in variations in the average growth of money are neutral, changes in the predictability of money have real effects. Thus, the best monetary policy is one that is most predictable.

### 12.3.3 Cyclical Fluctuations

Consider a situation where the value of money above trend indicates an unexpectedly high level of money in the recent past. The model predicts that this excess above trend would induce a higher level of output, work effort, and investment, all relative to trend. That is to say, money, employment, and investment would vary procyclically. These predictions correspond to the data. On the other hand, some predictions generated by the model fit the data less tightly. A monetary shock would, according to the theory, lead to an increase in the general price level and a fall in the expected interest rate. The evidence seems to not to support the proposition that the rise in the price level is procyclical and the expected real interest rate is countercyclical. Since the production function is assumed not to change, and the capital stock is given in the short run, the increase in the employment of labour implies that the marginal and average products of labour fall. The theory predicts that labour productivity and the real wage rate would be low when the volume of output and labour input are high. That is to say, labour productivity and the real wage rate vary counter-cyclically. This proposition, again, is not consistent with the data.

The conclusion is that there might be limitations to a model constructed to explain business fluctuations driven entirely by monetary surprises. Incorporating shifts in the production function and assigning monetary shocks a secondary role might be a superior strategy.

#### Check Your Progress 2

- 1) Real business cycle models explain fluctuations in output by means of exogenous shocks. The outcome is irregular fluctuations. Elaborate upon the difference between such random movements and the periodicity of cycles.

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Compare and contrast new classical models and real business cycle models of fluctuation with the models of cycles and unemployment in your module on cycles.

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- 2) Can there be surprise changes in the quantity of money when expectations are rational? In that case, do the monetary authorities possess the weapon of counteracting business cycles through unexpected increases in the quantity of money?

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- 3) When expectations are rational, agents cannot make mistakes on average in forecasting the price level. How, then, do we explain persistent deviations of aggregate output from trend?

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## 12.4 LET US SUM UP

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In this unit we discussed real business cycles which asserts that economic fluctuations are an outcome of real shocks to the economy. It is based on the assumption of rational expectations and shows that monetary policy has no real effects and shift in aggregate demand is not an important cause of fluctuations in output and employment.

The new classical business cycle theory puts emphasis on the changes in the structure of the division of labour. International trade and financial openness have made modern economics highly specialised with respect to division of labour and there is greater roundaboutness in production. Along with this there is an in-built force causing fluctuations in output and employment.

In real business cycle theory emphasis is given on real shocks such on technological change which shifts the production function. A productivity shock changes the level of output produced by given amount of inputs. The new classical economists, however, have not been able to convince all and the new-Keynesian economists still believe in the importance of aggregate demand in economic fluctuations. We will learn more about new-Keynesian view in Block-6.

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## 12.5 KEY WORDS

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- Division of Labour** : A method of organizing production in such a manner that each labour specializes in a part of the production process. It was Adam Smith who emphasized on the gains to the economy due to division of labour.
- Learning by Doing** : It refers to the improvement in efficiency of labour through experience.
- Pareto Efficiency** : It refers to allocation of resources in such a manner that further change in the allocation pattern cannot improve the utility or satisfaction of one individual without reducing that of another.
- Transaction costs** : The additional costs, apart from price of the commodity, required to carry out a transaction/ exchange.

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## 12.6 SOME USEFUL BOOKS

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Barro, Robert, *Macroeconomics*, New York: John Wiley & Sons, Inc.

Dornbusch, R., S. Fischer, and R. Startz, 2004, *Macroeconomics*, Take McGraw-Hill, New Delhi, Chapter 20.

Yang, Xiaokai, *Economics: New Classical versus Neoclassical Frameworks*, Oxford: Blackwell Publishers.

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## 12.7 ANSWER/HINTS TO CHECK YOUR PROGRESS EXERCISES

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### Check Your Progress 1

- 1) Read Section 12. 2 and answer.

### Check Your Progress 2

- 1) Go through Section 12.3 and answer.
- 2) Go through Section 12.3 and answer.
- 3) Go through Section 12.3 and answer.