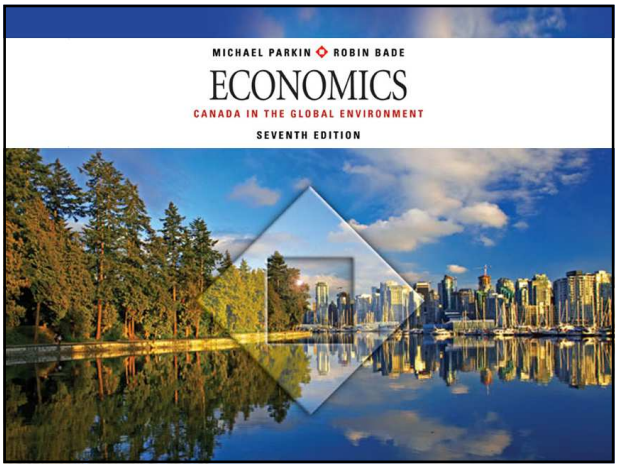


22 Economic Growth

After studying this chapter, you will be able to

- Define and calculate the economic growth rate and explain the implications of sustained growth
- Describe the economic growth trends in Canada and other countries and regions
- Explain how population growth and labour productivity growth make potential GDP grow
- Explain and measure the sources of labour productivity growth
- Explain the theories of economic growth and policies designed to increase the growth rate

Real GDP per person in Canada tripled in the 50 years between 1958 and 2008.

What has brought about this growth in production, incomes, and living standards?

We see even greater economic growth in modern Asia.

Incomes have tripled in the 13 years between 1995 and 2008.

Why are incomes in China growing so rapidly?

The Basics of Economic Growth

Economic growth is the sustained expansion of production possibilities measured as the increase in real GDP over a given period.

Calculating Growth Rates

The **economic growth rate** is the annual percentage change of real GDP.

The economic growth rate tells us how rapidly the total economy is expanding.

The Basics of Economic Growth

The standard of living depends on real GDP per person.

Real GDP per person is real GDP divided by the population.

Real GDP per person grows only if real GDP grows faster than the population grows.

The Basics of Economic Growth

The Magic of Sustained Growth

The **Rule of 70** states that the number of years it takes for the level of a variable to double is approximately 70 divided by the annual percentage growth rate of the variable.

The Basics of Economic Growth

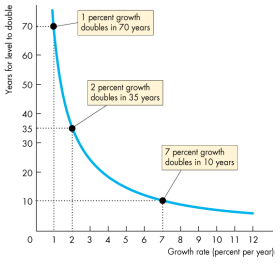
Applying the Rule of 70

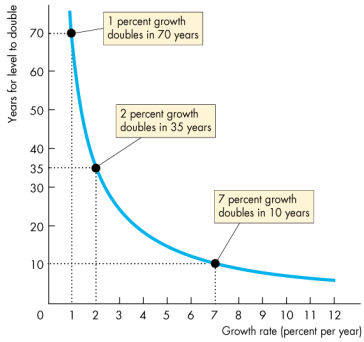
Figure 22.1 show the doubling time for growth rates.

A variable that grows at 7 percent a year doubles in 10 years.

A variable that grows at 2 percent a year doubles in 35 years.

A variable that grows at 1 percent a year doubles in 70 years.





Economic Growth Trends

Growth in the Canadian Economy

From 1926 to 2007, growth in real GDP per person in Canada averaged 2.1 percent a year.

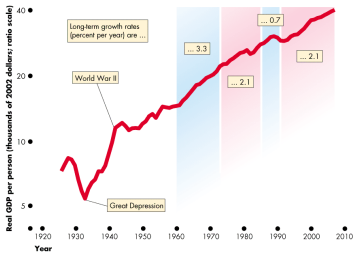
Real GDP per person fell precipitously during the Great Depression and rose rapidly during World War II.

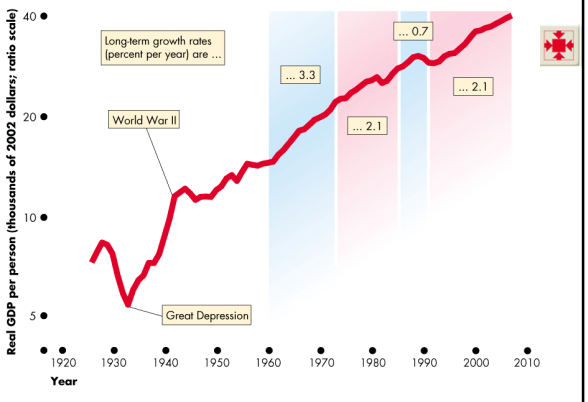
Growth was most rapid during the 1960s and averaged 3.3 percent a year.

Growth slowed during the 1970s and slowed again in the 1980s, but sped up after 1996.

Figure 22.2 on the next slide illustrates.

Economic Growth Trends





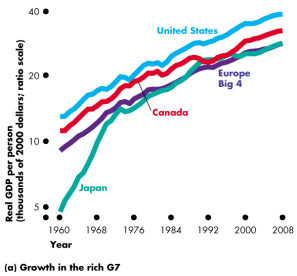
Economic Growth Trends

Real GDP Growth in the World Economy

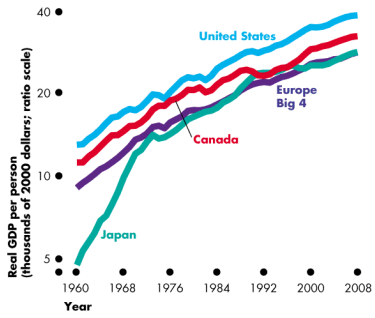
Figure 22.3(a) shows the growth in the rich countries.

Japan grew rapidly in the 1960s, slower in the 1980s, and even slower in the 1990s.

Growth in Europe Big 4, the United States, and Canada has been similar.



(a) Growth in the rich G7

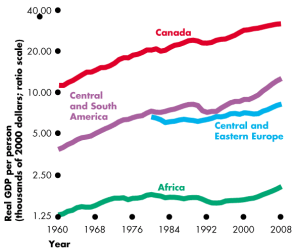


(a) Growth in the rich G7

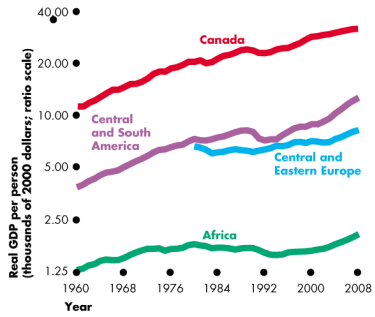
Economic Growth Trends

Figure 22.3(b) shows the growth of real GDP per person in group of poor countries.

The gaps between real GDP per person in Canada and in these countries have widened.



(b) Persistent gaps between rich and poor



(b) Persistent gaps between rich and poor

How Potential GDP Grows

Economic growth occurs when real GDP increases.

But a one-shot increase in real GDP or a recovery from recession is not economic growth.

Economic growth is the sustained, year-on-year increase in *potential GDP*.

How Potential GDP Grows

How Potential GDP Is Determined

Potential GDP is the quantity of real GDP produced when the quantity of labour employed is the full-employment quantity.

To determine potential GDP we use a model with two components:

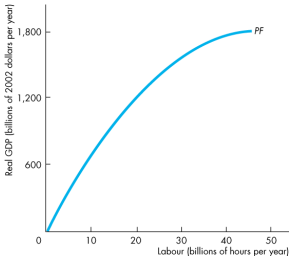
- The aggregate production function
- The aggregate labour market

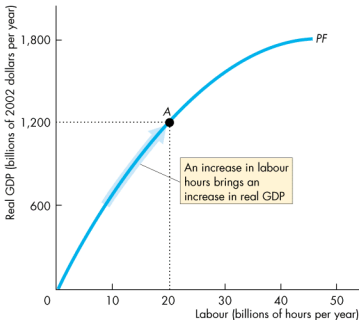
How Potential GDP Grows

Aggregate Production Function

The **aggregate production function** tells us how real GDP changes as the quantity of labour changes when all other influences on production remain the same.

An increase in labour increases real GDP.





How Potential GDP Grows

Aggregate Labour Market

The **real wage rate** is the money wage rate divided by the price level.

The demand for labour shows the quantity of labour demanded and the real wage rate.

The supply of labour shows the quantity of labour supplied and the real wage rate.

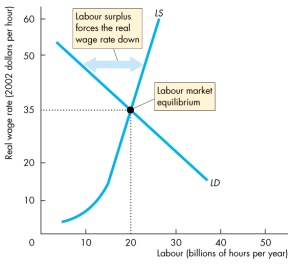
The labour market is in equilibrium at the real wage rate at which the quantity of labour demanded equals the quantity of labour supplied.

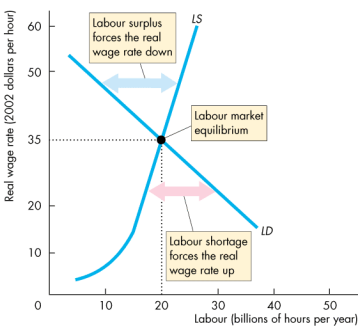
How Potential GDP Grows

Figure 22.5 illustrates labour market equilibrium.

Labour market equilibrium occurs at a real wage rate of $35 an hour and 20 billion hours employed.

At a real wage rate above $35 an hour, there is a surplus of labour and the real wage rate falls.

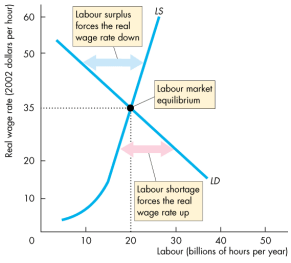




How Potential GDP Grows

At a real wage rate below $35 an hour, there is a shortage of labour and the real wage rate rises.

At the labour market equilibrium, the economy is at *full employment*.

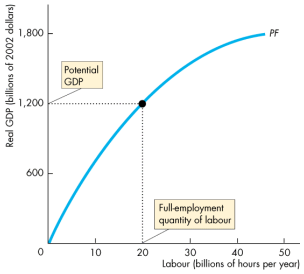


How Potential GDP …

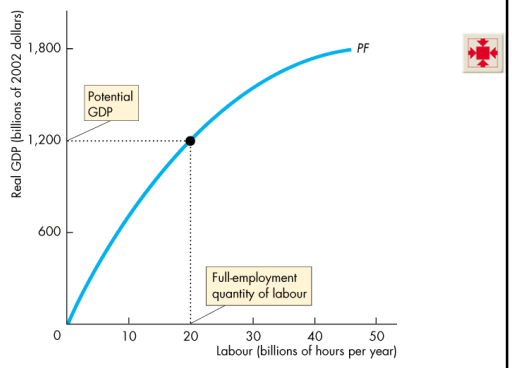
Potential GDP

The quantity of real GDP produced when the economy is at full employment is potential GDP.

When the full-employment quantity of labour is 20 billion hours, potential GDP is $1,200 billion.



(b) Potential GDP



(b) Potential GDP

How Potential GDP Grows

What Makes Potential GDP Grow?

We begin by dividing real GDP growth into the forces that increase:

- Growth in the supply of labour
- Growth in labour productivity

How Potential GDP Grows

Growth in the Supply of Labour

Aggregate hours, the total number of hours worked by all the people employed, change as a result of changes in:

1. Average hours per worker
2. Employment-to-population ratio
3. The working-age population growth

Population growth increases aggregate hours and real GDP, but to increase real GDP person, labour must become more productive.

How Potential GDP Grows

The Effects of Population Growth

An increase in population increases the supply of labour.

With no change in the demand for labour, the equilibrium real wage rate falls and the aggregate hours increase.

The increase in the aggregate hours increases potential GDP.

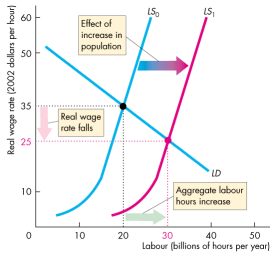
How Potential GDP Grows

Figure 22.8(a) illustrates the effects of population growth in the labour market.

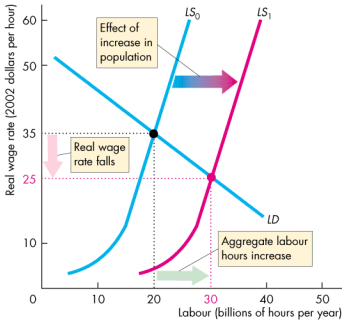
The labour supply curve shifts rightward.

The real wage rate falls

and aggregate hours increase.



(a) The labour market

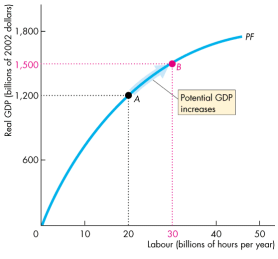


(a) The labour market

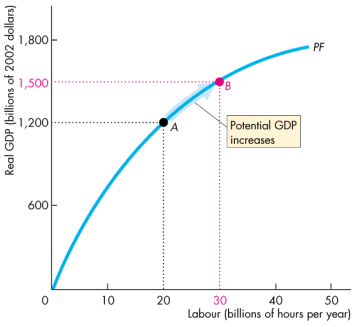
How Potential GDP Grows

The increase in aggregate hours increases potential GDP.

Because the diminishing returns, the increased population increases real GDP but decreases real GDP per hour of labour.



(b) Potential GDP



(b) Potential GDP

How Potential GDP Grows

Growth in Labour Productivity

Labour productivity is the quantity of real GDP produced by an hour of labour.

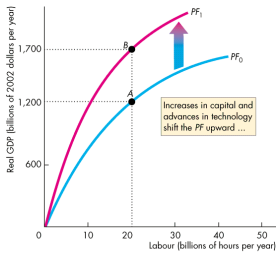
Labour productivity equals real GDP divided by aggregate labour hours.

If labour become more productive, firms are willing to pay more for a given number of hours so the demand for labour increases.

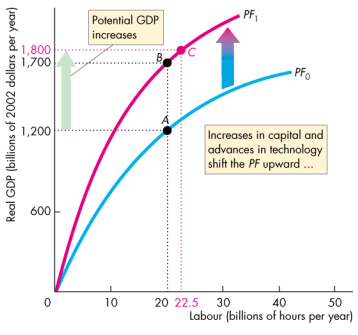
How Potential GDP Grows

Figure 22.8 shows the effect of an increase in labour productivity.

The increase in labour productivity shifts the production function upward.



(a) Potential GDP



(a) Potential GDP

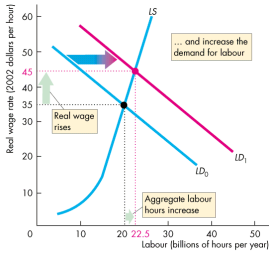
How Potential GDP Grows

In the labour market:

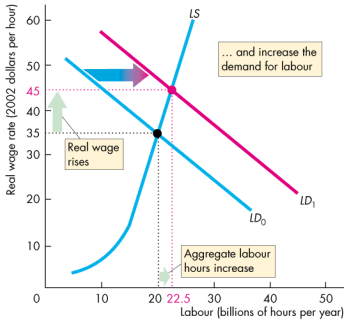
An increase in labour productivity increases the demand for labour.

With no change in the supply of labour, the real wage rate rises

and aggregate hours increase.



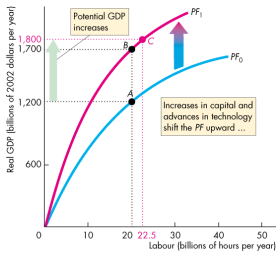
(b) The labour market



(b) The labour market

How Potential GDP Grows

And with the increase in aggregate hours, potential GDP increases.



(a) Potential GDP

Why labour Productivity Grows

Preconditions for Labour Productivity Growth

The fundamental precondition for labour productivity growth is the *incentive* system created by firms, markets, property rights, and money.

The growth of labour productivity depends on

- Physical capital growth
- Human capital growth
- Technological advances

Why labour Productivity Grows

Physical Capital Growth

The accumulation of new capital increases capital per worker and increases labour productivity.

Human Capital Growth

Human capital acquired through education, on-the-job training, and learning-by-doing is the most fundamental source of labour productivity growth.

Why labour Productivity Grows

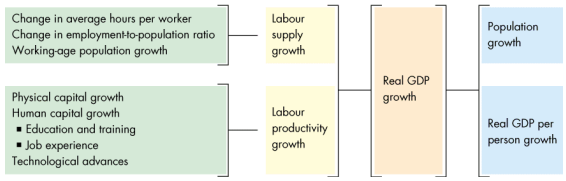
Technological Advances

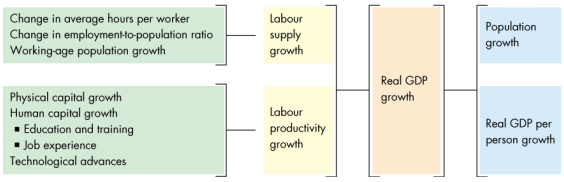
Technological change—the discovery and the application of new technologies and new goods—has contributed immensely to increasing labour productivity.

Figure 22.9 on the next slide summarizes the process of growth.

It also shows that the growth of real GDP per person depends on real GDP growth and the population growth rate.

Why Labour Productivity Grows





Why Labour Productivity Grows

The quantity of real GDP produced, *Y*, depends on the quantity of labour, *L*, the quantity of capital, *K*, and the state of technology, *T*.

Growth accounting calculates the contribution of capital growth and technological change to labour productivity growth.

Why Labor Productivity Grows

The Canadian Production Function

The Centre for the Study of Living Standards discovered that on average with no change in technology,

a 1 percent increase in capital per hour of labour brings an 0.49 percent increase in labor productivity.

Why Labor Productivity Grows

For example, suppose capital per hour of labour grows by 3 percent and labour productivity grows by 2.5 percent.

The 0.49 percent rule tells us that capital growth contributed 0.49 of 3 percent, which is 1.47 percent, to labor productivity growth.

The remaining 1.03 percent of labor productivity growth comes from technological change.

Why Labor Productivity Grows

Accounting for the Productivity Growth Slowdown and Speedup

We can use the 0.49 percent rule to study productivity growth in Canada.

Figure 23.10 on the next slide illustrates.

Why Labour Productivity Grows

Accounting for the Productivity Growth Slowdown and Speedup

We can use the growth accounting to study productivity growth in Canada.

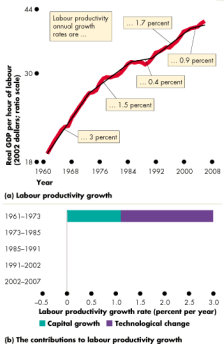
Figure 22.10 on the next slide illustrates.

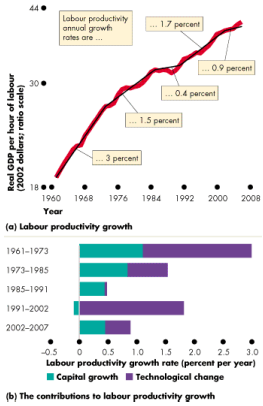
Why Labour Productivity Grows

Part (a) shows the growth of labour productivity in Canada.

Between 1961 and 1973, labour productivity grew by 3 percent a year.

Part (b) shows that capital growth (green bar) contributed about 1/3 and technological change (purple bar) contributed about 2/3 of this growth.

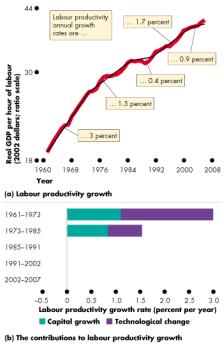




Why Labour Productivity Grows

Between 1973 and 1983, labour productivity slowed to 1.5 percent a year.

A collapse in the contribution of technological change (purple bar) brought about this slowdown in the growth of labour productivity.

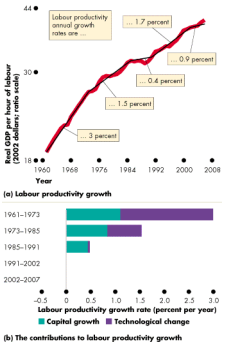


Why Labour Productivity Grows

Labour productivity growth rate slowed again …

to 0.4 percent a year between 1985 and 1991.

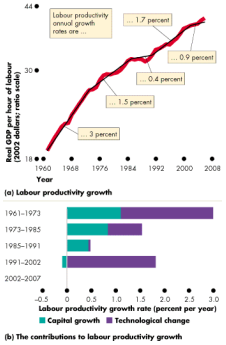
A collapse of the contributions of technological change and human capital brought this slowdown.



Why Labour Productivity Grows

Labour productivity growth rate increased to 1.7 percent a year between 1991 and 2002.

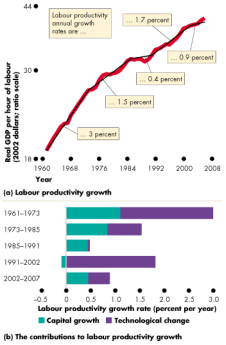
Technological change contributed most to this speedup in the growth of labour productivity.



Why Labour Productivity Grows

Labour productivity growth rate decreased to 0.9 percent a year between 2002 and 2007.

Technological change contributed most to this fall in the growth of labour productivity.



Growth Theories and Policies

We study three growth theories:

- Classical growth theory
- Neoclassical growth theory
- New growth theory

Classical Growth Theory

Classical growth theory is the view that the growth of real GDP per person is temporary and that when it rises above the subsistence level, a population explosion eventually brings real GDP per person back to the subsistence level.

Growth Theories and Policies

Classical Theory of Population Growth

There is a **subsistence real wage rate**, which is the minimum real wage rate needed to maintain life.

Advances in technology lead to investment in new capital.

Labour productivity increases and the real wage rate rises above the subsistence level.

When the real wage rate is above the subsistence level, the population grows.

Population growth increases the supply of labour and brings diminishing returns to labour.

Growth Theories and Policies

As the population increases the real wage rate falls.

The population continues to grow until the real wage rate has been driven back to the subsistence real wage rate.

At this real wage rate, both population growth and economic growth stop.

Contrary to the assumption of the classical theory, the historical evidence is that population growth rate is not tightly linked to income per person, and population growth does not drive incomes back down to subsistence levels.

Growth Theories and Policies

Neoclassical Growth Theory

Neoclassical growth theory is the proposition that real GDP per person grows because technological change induces a level of saving and investment that makes capital per hour of labour grow.

Growth ends only if technological change stops.

Growth Theories and Policies

The Neoclassical Economics of Population Growth

The neoclassical view is that the population growth rate is independent of real GDP and the real GDP growth rate.

Technological Change

In the neoclassical theory, the rate of technological change influences the economic growth rate but economic growth does not influence the pace of technological change.

It is assumed that technological change results from chance.

Growth Theories and Policies

The Basic Neoclassical Idea

Technology begins to advance more rapidly.

New profit opportunities arise.

Investment and saving increase.

As technology advances and the capital stock grows, real GDP per person rises.

Diminishing returns to capital lower the real interest rate and eventually growth stops, unless technology keeps on advancing.

Growth Theories and Policies

A Problem with Neoclassical Growth Theory

All economies have access to the same technologies and capital is free to roam the globe, seeking the highest available real interest rate.

These facts imply that economic growth rates and real GDP per person across economies will converge.

Figure 22.3 shows some convergence among rich countries, but convergence is slow.

Growth Theories and Policies

New Growth Theory

New growth theory holds that real GDP per person grows because of choices that people make in the pursuit of profit and that growth can persist indefinitely.

The theory begins with two facts about market economies:

- Discoveries result from choices.
- Discoveries bring profit and competition destroys profit.

Growth Theories and Policies

Two further facts play a key role in the new growth theory:

- Discoveries are a public capital good.
- Knowledge is not subject to diminishing returns.

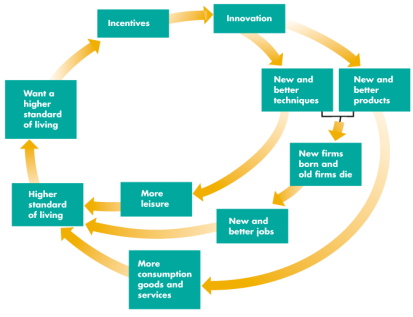
Knowledge Capital Is Not Subject to Diminishing Returns

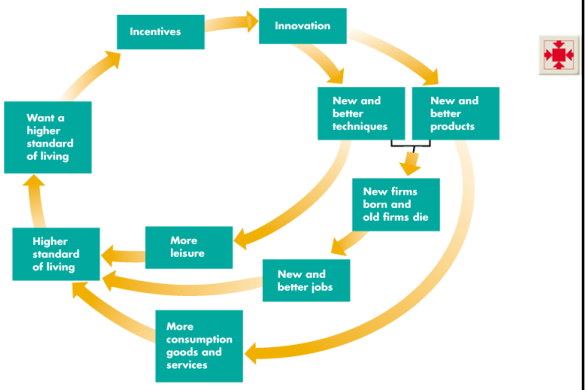
Increasing the stock of knowledge makes capital and labour more productive.

Knowledge capital does *not* experience diminishing returns is the central proposition of new growth theory.

Growth Theories and Policies

Figure 22.11 summarizes the ideas of new growth theory as a perpetual motion machine.





Growth Theories and Policies

Achieving Faster Growth

Growth accounting tell us that to achieve faster economic growth we must either increase the growth rate of capital per hour of labour or increase the pace of technological change.

The main suggestions for achieving these objectives are

Stimulate Saving

Saving finances investment. So higher saving rates might increase physical capital growth.

Tax incentives might be provided to boost saving.

Growth Theories and Policies

Stimulate Research and Development

Because the fruits of *basic* research and development efforts can be used by everyone, not all the benefit of a discovery falls to the initial discoverer.

So the market might allocate too few resources to research and development.

Government subsidies and direct funding might stimulate basic research and development.

Growth Theories and Policies

Encourage International Trade

Free international trade stimulates growth by extracting all the available gains from specialization and trade.

The fastest growing nations are the ones with the fastest growing exports and imports.

Improve the Quality of Education

The benefits from education spread beyond the person being educated, so there is a tendency to under invest in education.