

# Macroeconomics 1 (ECON1102)

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“The AD-AS Model”

# AD-AS

- We have considered a long-run model of the macroeconomy, namely the Solow-Swan growth model. Now we must build a comparable model for the macroeconomy in the short-run.
- The **Aggregate Demand and Aggregate Supply (AD-AS) model** examines how short-run fluctuations in real GDP and the price level occur and how they affect total output.
- The basic idea: Real GDP and the price level are determined in the short run by the intersection of the short-run Aggregate Demand (AD) curve and the short-run Aggregate Supply (AS) curves.

# AD and AS curves

- **Aggregate demand (AD) curve:** A curve that shows the relationship between the price level (or inflation rate as an alternative but equivalent specification) and the quantity of real GDP demanded by households, firms and the government, i.e. the whole economy. We derived this curve last time from the AE model.
- **Aggregate supply (AS) curve:** In this case we have two versions: **Short-run aggregate supply (SRAS) curve:** A curve that shows the relationship in the short run between the price level and the quantity of real GDP supplied; **Long-run aggregate supply (LRAS) curve:** a similar curve for the long-run. Unless explicitly noted reference to an AS curve can be assumed to be short-run.

## The AD Curve v market demand curves

- Remember that the AD curve is fundamentally different than the microeconomic market demand curve.
- An **AD curve** is built up from the demand expenditures side of the whole economy –  $C+I+G+NX$  – and in this sense represents a short-run balance across these components across all micro-markets for goods and services. It shows total AD (or AE) associated with different price levels.
- A **market** demand curve is, by contrast, the sum of willingness-to-pay for a given good at various prices across all potential buyers of that good. Both D curves slope downward but the reason for a negatively sloped **market** demand curve is due to the fact consumers are generally willing to buy less of a good the more its price increases. (The AS curve is also different from the market S curve – more on that later).

# Violating the classical dichotomy

- Note that positing a relationship between *nominal* price levels and *real* output violates the classical dichotomy and the neutrality of money.
- This is because the dichotomy/neutrality holds only in the *long-run*.
- AD is a *short-run* model where lags and rigidities in adjustment lead to nominal quantities having real effects.
- The same can be said for the AS curve and its interactions with AD. This is a short-run model and in the short-run nominal quantities can affect real ones.

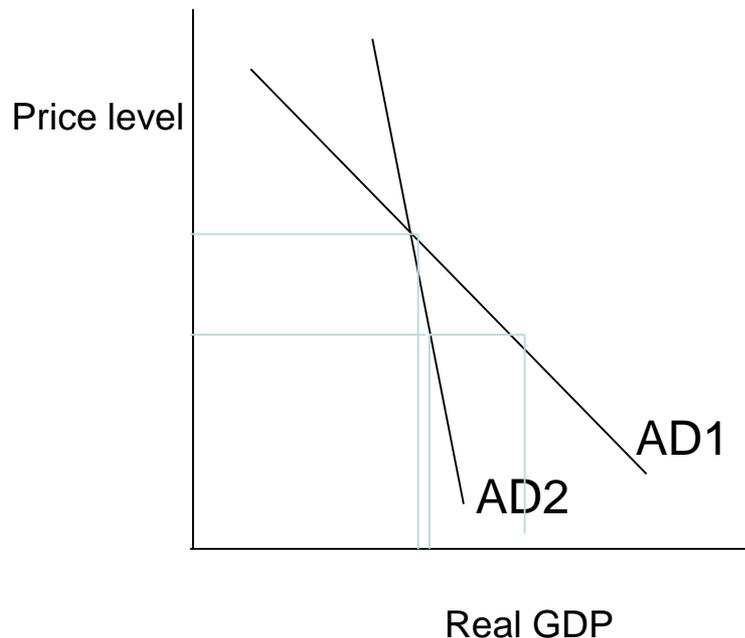
# Aggregate Demand (AD) slope sign

Why is the aggregate demand curve *downward sloping* (i.e. the sign of the slope is negative)? Since AD is derived from AE, we know the major reasons for this (all short-term):

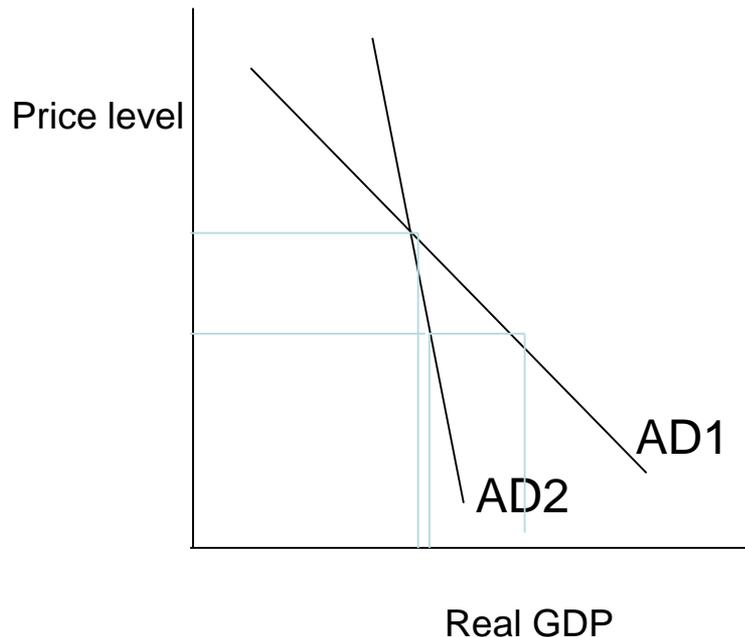
1. The wealth effect
  - A change in the price level affects real wealth and hence consumption.
2. The interest-rate effect
  - A change in the price level affects real interest rate and hence investment (primarily).
3. The international-trade effect
  - A change in the price level affects relative real price of foreign and domestic goods and also international exchange rates and hence net exports.

# Aggregate Demand (AD) slope magnitude

- The AD curve shows the relationship between the price level and the quantity of real GDP demanded, holding everything else constant. Since relationships of C, I, G and NX to AD given changes in price level are all inverse, price level rises reduce one or more of these components, reduce real GDP and *make the sign of the AD slope negative*.
- The *strength of the various effects* makes the curve shallower or steeper, ceteris paribus (i.e. *changes the magnitude of the slope*). Thus, if I, say, is very sensitive to real interest rate changes as affected by price level, then the AD curve will be flatter than when I is not very sensitive to such changes.



- Here is an example of two different AD curves. AD1 is flatter than AD2, which means that the ‘elasticity’ (responsiveness) of Real GDP to price level is much greater than that of the steeper AD2.
- So we can see that a change in the price level in either direction changes Real GDP much more where AD1 holds than for AD2 (which is relatively ‘inelastic’).



- What determines AD elasticity?
- Recall that the AD curve shows the relationship between different price levels and different real GDP levels and is drawn from the AE curve consisting of  $C+I+G+NX$ .
- Also recall that each one of these expenditure categories has functions behind them (e.g. the consumption function).
- It is through these functions that we can determine responsiveness of real GDP to nominal price changes.

# A conceptual example

- Suppose we have two different economies (or the same economy but in two different years). Call them Economy 1 and Economy 2. (If we were looking at the same economy but at different times we could say Economy 1<sub>t</sub> and Economy 1<sub>t+5</sub> to indicate, for example, time  $t$  and then time  $t+5$ , e.g. 5 years later for Economy 1)
- Both economies have the same expenditure functions except that 1 has an investment function ( $I$ ) where investors are much *more* responsive to changes in short-run real interest rates than with 2.
- Which economy has a flatter AD curve?

# Answer

- First we have to think of what ‘flatter’ means. It means that a change in the price level will yield a greater change in Real GDP, *ceteris paribus*. In other words, a flatter curve will be more ‘elastic’ or responsive.
- Conceptually it should then be clear that 1 will have a flatter (more responsive) curve than 2 because the economies ( $Y=C+I+G+NX$ ) are entirely identical *except* for their  $I$  functions, where  $I$  in economy 1 will adjust more to real interest rate changes than  $I$  in 2.
- Intuitively what is happening is that  $I$  in 1 will shift much more in response to a given a change in nominal interest rates in the short-run than in 2 as price level changes in 1 will, by changing the real interest rate, up or down, yield a greater change in  $I$  in that economy than in 1.

# Aggregate Demand (AD) shifts

Slope refers to *movements along the curve*. They are, in effect, due to *endogenous* factors. But the AD curve may *shift* left or right as well. This would be the case when an *exogenous* ‘shock’ occurs.

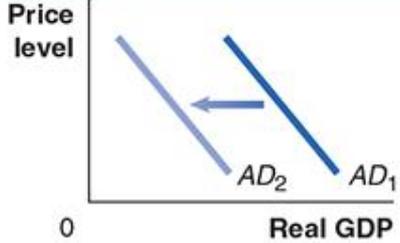
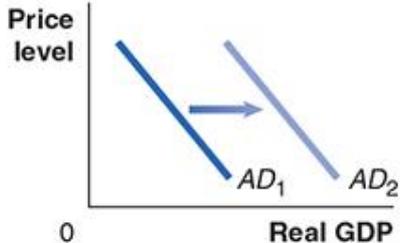
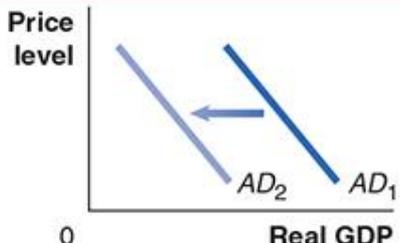
Variables that shift the aggregate demand curve include:

1. Changes in government policies.
  - Examples: taxes; government purchases.
2. Changes in the expectations of households and firms.
3. Changes in foreign variables in economies outside the domestic economy, e.g. relative income levels between countries.

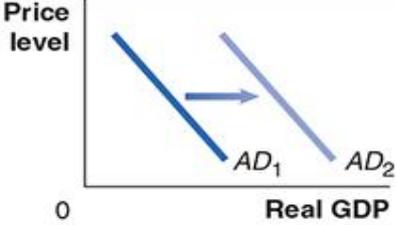
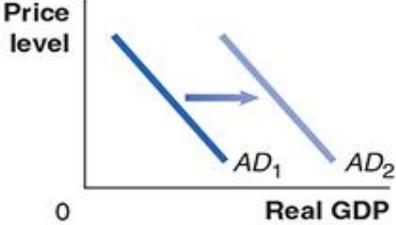
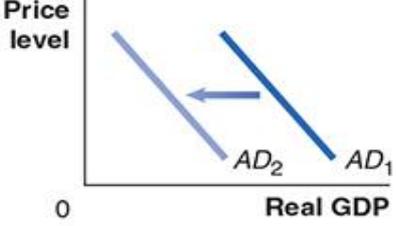
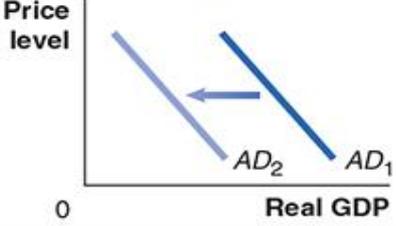
# A note on ‘shifts’ versus ‘movements along’

- In a *movement along a curve* everything is held constant and we are looking at a line that shows the tradeoff between real GDP and different possible price levels, driven by the components of AE, *ceteris paribus*.
- In *shifts of the curve* there is an exogenous shock that changes the overall economic structure and the associated functions, e.g. an increase in government taxes and how that shifts C, G, I and NX entirely, upsetting former patterns.
- Thus if price level changes but nothing else does, we have a *movement along* the AD curve: i.e. everything else in the economy, including the functions behind C, I, G and NX, are fixed and we are just looking at the set tradeoff between total real GDP and changes in price levels. If there is a change to the parameters, e.g. expectations about consumer incomes, then this *shifts* AD.

# Variables that shift the aggregate demand curve

AN INCREASE IN ...	SHIFTS THE AGGREGATE DEMAND CURVE ...	BECAUSE ...
interest rates	 <p>The graph shows a coordinate system with 'Price level' on the vertical axis and 'Real GDP' on the horizontal axis. The origin is marked with '0'. Two downward-sloping lines represent aggregate demand curves: a darker blue line labeled <math>AD_1</math> and a lighter blue line labeled <math>AD_2</math>. A horizontal arrow points from <math>AD_1</math> to <math>AD_2</math>, indicating a leftward shift.</p>	higher interest rates raise the cost to firms and households of borrowing, reducing investment and consumption spending
government purchases	 <p>The graph shows a coordinate system with 'Price level' on the vertical axis and 'Real GDP' on the horizontal axis. The origin is marked with '0'. Two downward-sloping lines represent aggregate demand curves: a darker blue line labeled <math>AD_1</math> and a lighter blue line labeled <math>AD_2</math>. A horizontal arrow points from <math>AD_1</math> to <math>AD_2</math>, indicating a rightward shift.</p>	government purchases are a component of aggregate demand
personal income taxes or business taxes	 <p>The graph shows a coordinate system with 'Price level' on the vertical axis and 'Real GDP' on the horizontal axis. The origin is marked with '0'. Two downward-sloping lines represent aggregate demand curves: a darker blue line labeled <math>AD_1</math> and a lighter blue line labeled <math>AD_2</math>. A horizontal arrow points from <math>AD_1</math> to <math>AD_2</math>, indicating a leftward shift.</p>	consumption spending falls when personal taxes rise, and investment falls when business taxes rise

# Variables that shift the aggregate demand curve

AN INCREASE IN ...	SHIFTS THE AGGREGATE DEMAND CURVE ...	BECAUSE ...
households' expectations of their future incomes	 <p>The graph shows a coordinate system with 'Price level' on the vertical axis and 'Real GDP' on the horizontal axis. The origin is marked with '0'. Two downward-sloping lines represent aggregate demand curves: a solid blue line labeled <math>AD_1</math> and a dashed purple line labeled <math>AD_2</math>. A horizontal blue arrow points from <math>AD_1</math> to <math>AD_2</math>, indicating a rightward shift.</p>	consumption spending increases
firms' expectations of the future profitability of investment spending	 <p>The graph shows a coordinate system with 'Price level' on the vertical axis and 'Real GDP' on the horizontal axis. The origin is marked with '0'. Two downward-sloping lines represent aggregate demand curves: a solid blue line labeled <math>AD_1</math> and a dashed purple line labeled <math>AD_2</math>. A horizontal blue arrow points from <math>AD_1</math> to <math>AD_2</math>, indicating a rightward shift.</p>	investment spending increases
the growth rate of domestic GDP relative to the growth rate of foreign GDP	 <p>The graph shows a coordinate system with 'Price level' on the vertical axis and 'Real GDP' on the horizontal axis. The origin is marked with '0'. Two downward-sloping lines represent aggregate demand curves: a solid blue line labeled <math>AD_1</math> and a dashed purple line labeled <math>AD_2</math>. A horizontal blue arrow points from <math>AD_1</math> to <math>AD_2</math>, indicating a leftward shift.</p>	exports will fall, reducing net exports
the exchange rate (the value of the dollar relative to foreign currencies)	 <p>The graph shows a coordinate system with 'Price level' on the vertical axis and 'Real GDP' on the horizontal axis. The origin is marked with '0'. Two downward-sloping lines represent aggregate demand curves: a solid blue line labeled <math>AD_1</math> and a dashed purple line labeled <math>AD_2</math>. A horizontal blue arrow points from <math>AD_1</math> to <math>AD_2</math>, indicating a leftward shift.</p>	imports will rise and exports will fall, reducing net exports

# Prior example of Economies 1 and 2

- One might now ask: a change in price level can affect real interest rates which affects real GDP and this was a movement along the AD curve. But isn't that also a shift of the curve?
- The answer is: it depends on what you are talking about exactly. The AD curve shows a static tradeoff between price level and AE ( $C+I+G+NX$ ), that tradeoff being determined by channels such as the interest rate, *ceteris paribus*, at that moment at existing spending functions.
- But if the whole structure of interest rates changes because of, say, a change in central bank policy, then we have changed the whole economy and shifted the whole set of tradeoff patterns as a result. This is a shift of the whole curve, not just a movement along it.
- In our prior example, we had two economies with everything the same, including the interest rate structure (often referred to as the term structure of interest rates) but one economy had a different  $I$  function than the other and hence a different shaped AD curve (read: static set of tradeoffs between real GDP and price level).
- If we now introduced an identical exogenous shock to those economies in the form of a tighter central bank monetary policy (i.e. term structure of interest rates goes up) both curves would shift – but they would also both keep their relative slopes (*ceteris paribus*).

## Solved Problem 1

### Determinants of aggregate demand

Explain whether each of the following will cause a movement along or a shift of the AD curve.

In each case, specify which of the four components of AD will be impacted, and explain how.

- a) Rising interest rates cause a drop in consumer optimism as households become concerned about their ability to meet mortgage payments.
- b) An increase in the price level decreases the value of superannuation accounts held by Australian households to fund their retirement.
- c) The Australian dollar falls in value against the US dollar and other major currencies.

## Solved Problem 1

(a): Households become pessimistic about the future. In order to ensure they can continue to meet higher mortgage payments caused by rising interest rates, consumers spend less in the present. The  $AD$  curve will shift inwards to the left.

(b): This is an example of the wealth effect. An increase in the price level decreases the real value of superannuation funds. Aggregate quantity demanded will decrease as households spend less in order to contribute more to their superannuation. This is reflected in an upward movement along the  $AD$  curve.

(c): A fall in the value of the Australian dollar means it costs less in terms of other currencies to buy Australian dollars, and hence also goods, services and investments denominated in Australian dollars. Net exports should therefore increase, and this will be reflected in an increase in aggregate demand—a shift to the right of the  $AD$  curve.

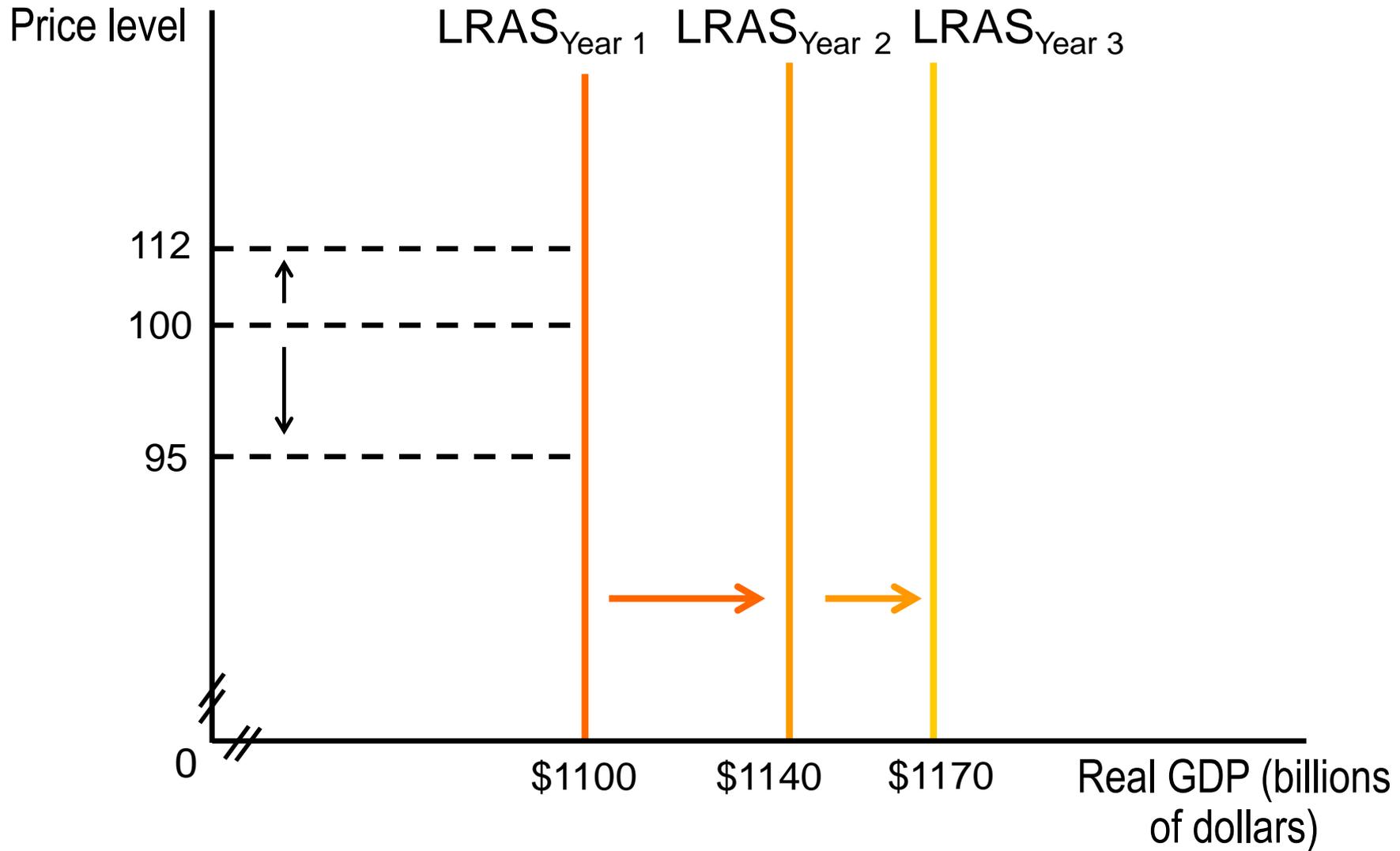
# Aggregate Supply (AS)

- Now we must talk about Aggregate Supply in the short-run macroeconomy.
- We have two AS curves one for the long-run (LRAS – Long Run Aggregate Supply) and one for the short-run (SRAS – Short Run Aggregate Supply).
- Let's take a closer look at these two.
- (Note: if 'AS' – Aggregate Supply – is referred to one can assume that it is being used synonymously with SRAS.

# Aggregate Supply (AS) – (1) long run

- **Long-run aggregate supply (LRAS) curve:** A curve that shows the relationship in the *long run* between the price level and the quantity of real GDP supplied. The long-run aggregate supply curve shows that, in the long run, increases in the price level do not affect the level of real GDP. That is, in the long-run the classical dichotomy holds and price levels/inflation do NOT affect real GDP. The long-run aggregate supply curve is a vertical line at potential GDP.
- Conceptually one attains the potential GDP number from the Solow-Swan long-run model (LRAS) and the goal of growth policy is to increase that number. The goal of short-run policy is to make sure the macroeconomy is hitting that number.

# The long-run aggregate supply curve



# Shifts in the LRAS

- Changes in the price level do not affect the level of aggregate supply in the long run. Therefore, the long-run aggregate supply (LRAS) curve is a vertical line at potential GDP. For instance, the price level in the prior graph was 100 in Year 1 and potential GDP was \$1100 billion. If the price level had been 95, or if it had been 112, LRAS would still have been a constant \$1100 billion.
- But the LRAS curve DOES move (shift) with time as the number of workers in the economy increases, more machinery and equipment is accumulated and technological change occurs. In other words, The *LRAS* curve shifts because potential GDP increases over time (assuming positive growth). (Think: Solow-Swan growth model)

# Aggregate supply (AS) – (2) Short run

- **Short-run aggregate supply (SRAS) curve:** an upward sloping curve, showing the relationship in the short-run between price level and real GDP supplied; in the short run, firms will produce more in response to higher prices. (Money is NOT neutral in the short run).
- Broadly speaking, this is because the prices of inputs (i.e. L and K) tend to rise more slowly than the prices of final products. Reasons for this include:
  - Contracts that make some wages and prices ‘sticky’.
  - Firms that are often slow to adjust wages.
  - Menu costs – costs of adjusting prices - that make some prices sticky.

# SRAS upward slope in detail

- There are three major theories that potentially ‘explain’ the positive relationship between inflation (or price level) and output.
- These are not mutually exclusive and can be present at the same time, though some economists favour one over another.
- (1) money illusion
- (2) Sticky wages (‘Keynesian’)
- (3) Sticky prices (‘New Keynesian’)

# 1. Money Illusion

- This refers to the idea that in the short-run people can ‘misread’ inflation as higher or lower than it actually is. People plan for the future based on their expectations of inflation when what counts in the end is actual inflation. If actual inflation during a period is different than the inflation they think has prevailed, they can have a (temporary) illusion as to the real value of wages or prices or interest rates based on a (temporary) misunderstanding of what inflation actually is.
- Thus a producer may first see rising nominal product prices as a real price increase if there is mismatch between what they think inflation is and what it actually is, and often this is what happens. E.g. a firm might see the prices they get for their goods go up by 5%, think inflation is 2% and conclude they have gained a 3% real price increase. This will cause them to invest more – until they find out that actual inflation was 5%. But in the short-run inflation is tied to higher output.
- Keynes noted this phenomenon. New Classical theorists (e.g. Robert Lucas) took this and made a whole theory based on this – more later.

## 2. Sticky wages

- Wages may take more time to adjust than prices, based on things like contracts (e.g. enterprise agreements for multiple years), and social conventions such as perceptions of fairness, which are slow to adjust.
- If actual inflation is below what it was expected to be when wages were set then output will fall since the real wage is higher than expected – until wages can finally adjust. The opposite is true for when actual inflation is higher than it was expected to be when wages were set. Firms now have lower real wages *in actual fact*, they know it, and rationally increase output. Again, positive inflation is associated, short-run, with higher output. This dynamic is often called ‘Keynesian’ because Keynes did consider this scenario at some length. NOTE: This is an impact separate from ‘money illusion’ which refers to actions taken based on a misreading of reality. Here there is a short-run real effect that is seen and ‘rationally’ reacted to.

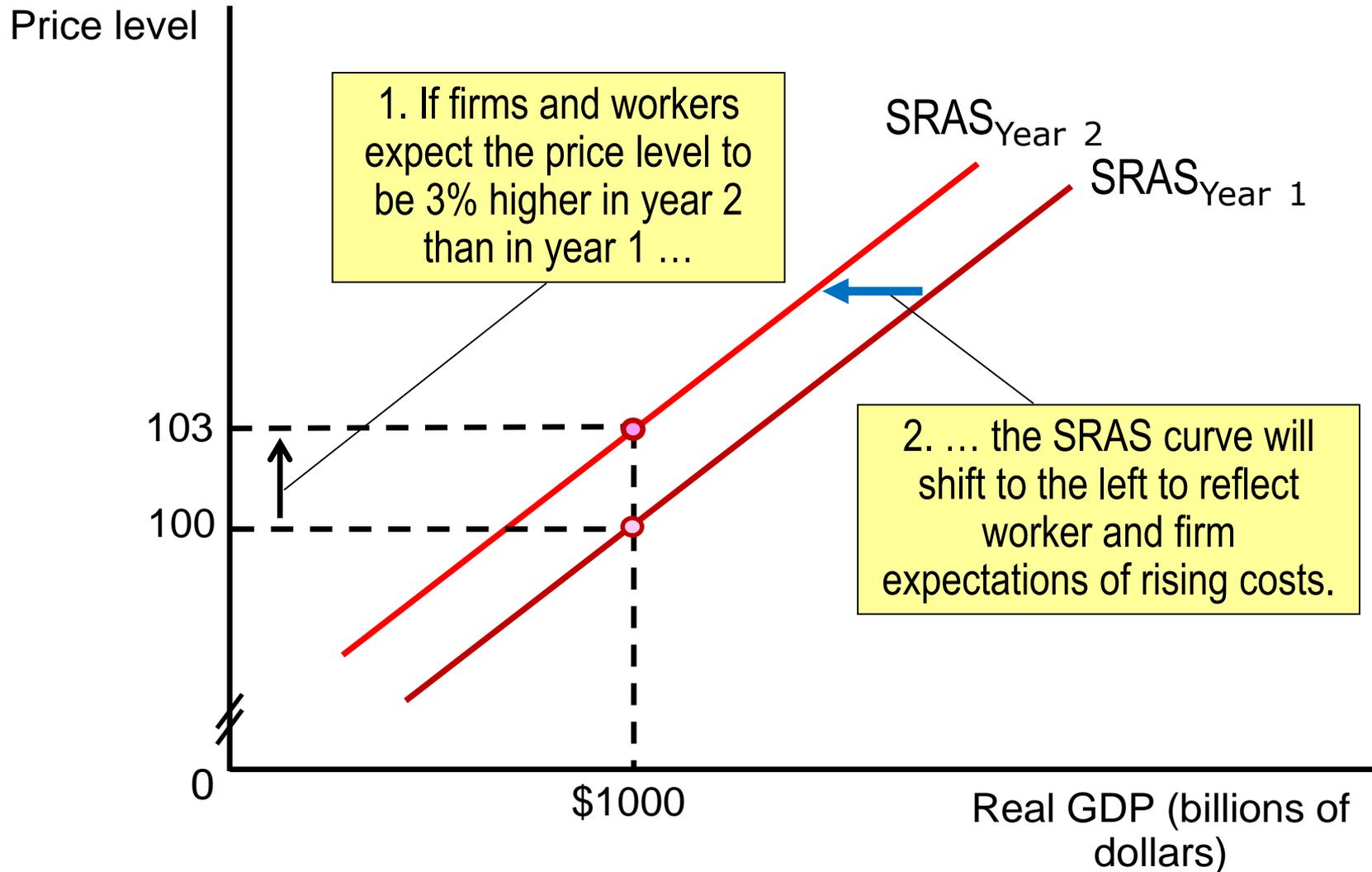
### 3. Sticky prices

- There also may be sticky prices for goods and services (as opposed to prices of labour, i.e. wages). E.g. for some goods there may be long-term contracts with purchasers or complex pricing schemes that take time to be adjusted.
- In this case firms with sticky nominal prices have, until they can adjust them, real prices that are affected by actual inflation. If inflation is higher than expected, then these real prices are lower and this stimulates demand and output; if lower, the opposite. In both cases higher inflation is associated with higher output in the short-run.
- This is sometimes called ‘New Keynesian’, associated with theorists of that school and is distinguished from Keynes’ writings which focused on the age stickiness side (Keynes just did not consider price stickiness in any great detail).

# SRAS shifts v movements

- The SRAS curve shows the short-run relationship between the price level and the quantity of goods and services (real GDP) firms are willing to supply, holding everything else constant.
- Changes in the price level are depicted as movements along a stationary short-run aggregate supply curve.
- But, just as with AD, SRAS can shift too, when there is some kind of ‘exogenous’ shock, such as: expected changes in the future price level; adjustments of workers and firms to errors in past expectations about the price level; unexpected changes in the price of an important natural resource.

# How expectations of the future price level affect short-run aggregate supply



# Expectations of the future price level and SRAS

- What the graph is depicting is the following:
- The SRAS curve shifts to reflect workers' and firms' expectations of future prices.
- If workers and firms expect the price level to rise by 3% from 100 to 103, they will adjust their wages and prices by that amount.
- Holding constant all other variables that affect aggregate supply, the SRAS curve will shift to the left.
- If workers and firms expect the price level to be lower in the future, the SRAS curve will shift to the right.

# Variables that shift both SRAS and LRAS

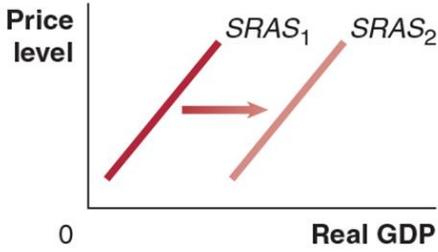
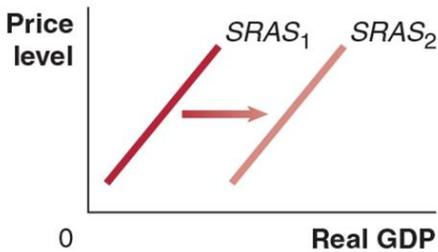
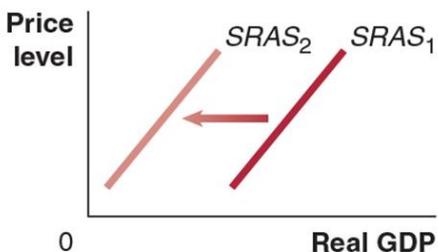
Some variables shift **ONLY** the SRAS, e.g. inflation expectations. But some increase **BOTH** SRAS and LRAS at the same time.

Two key ones are:

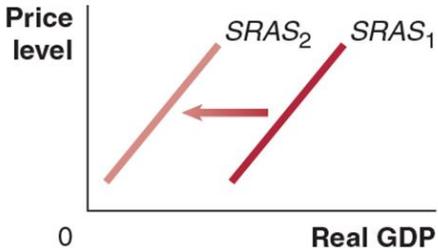
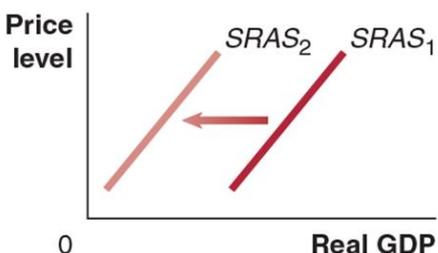
- Increases in the labour force (L) and/or in the capital stock and/or in resources (K).
- Technological change (A).

These changes have both short-run and long-run effects. The Solow-Swan model indicates this ( $Y=f(K,L)$ ). So changes in these factors both change long-run growth and also the tradeoff between price level and short-run output.

# Variables that shift the short-run aggregate supply curve

AN INCREASE IN ...	SHIFTS THE SHORT-RUN AGGREGATE SUPPLY CURVE ...	BECAUSE ...
the labour force or the capital stock or resources		more output can be produced at every price level
productivity		costs of producing output fall
the expected future price level		costs of producing output rise

# Variables that shift the short-run aggregate supply curve

AN INCREASE IN ...	SHIFTS THE SHORT-RUN AGGREGATE SUPPLY CURVE ...	BECAUSE ...
<p>workers and firms adjusting to having previously underestimated the price level</p>	 <p>The graph shows a coordinate system with 'Price level' on the vertical axis and 'Real GDP' on the horizontal axis. The origin is marked with '0'. Two upward-sloping lines represent short-run aggregate supply curves: a red line labeled <math>SRAS_1</math> and a light blue line labeled <math>SRAS_2</math>. An arrow points from <math>SRAS_1</math> to <math>SRAS_2</math>, indicating a leftward shift.</p>	<p>workers and firms increase wages and prices</p>
<p>the expected price of an important natural resource</p>	 <p>The graph shows a coordinate system with 'Price level' on the vertical axis and 'Real GDP' on the horizontal axis. The origin is marked with '0'. Two upward-sloping lines represent short-run aggregate supply curves: a red line labeled <math>SRAS_1</math> and a light blue line labeled <math>SRAS_2</math>. An arrow points from <math>SRAS_1</math> to <math>SRAS_2</math>, indicating a leftward shift.</p>	<p>costs of producing output rise</p>

## Shifts versus movements along *redux*

- Remember the SRAS curve, like the AD curve, shows the tradeoff between inflation and output in the short-run, *ceteris paribus*.
- As soon as we exogenously change something, such as the entire schedule of wages and prices across an economy, the curve will generally shift too – i.e. there is now a new tradeoff curve.
- The slope can change too, if there are changes in relationships, e.g. a change in technology can also change the relationship between output and a particular natural resource (e.g. oil) and make the SRAS curve more or less elastic with respect to inflation depending on how output's relationship to that input is changed. (We'll generally stick just to shifts however).

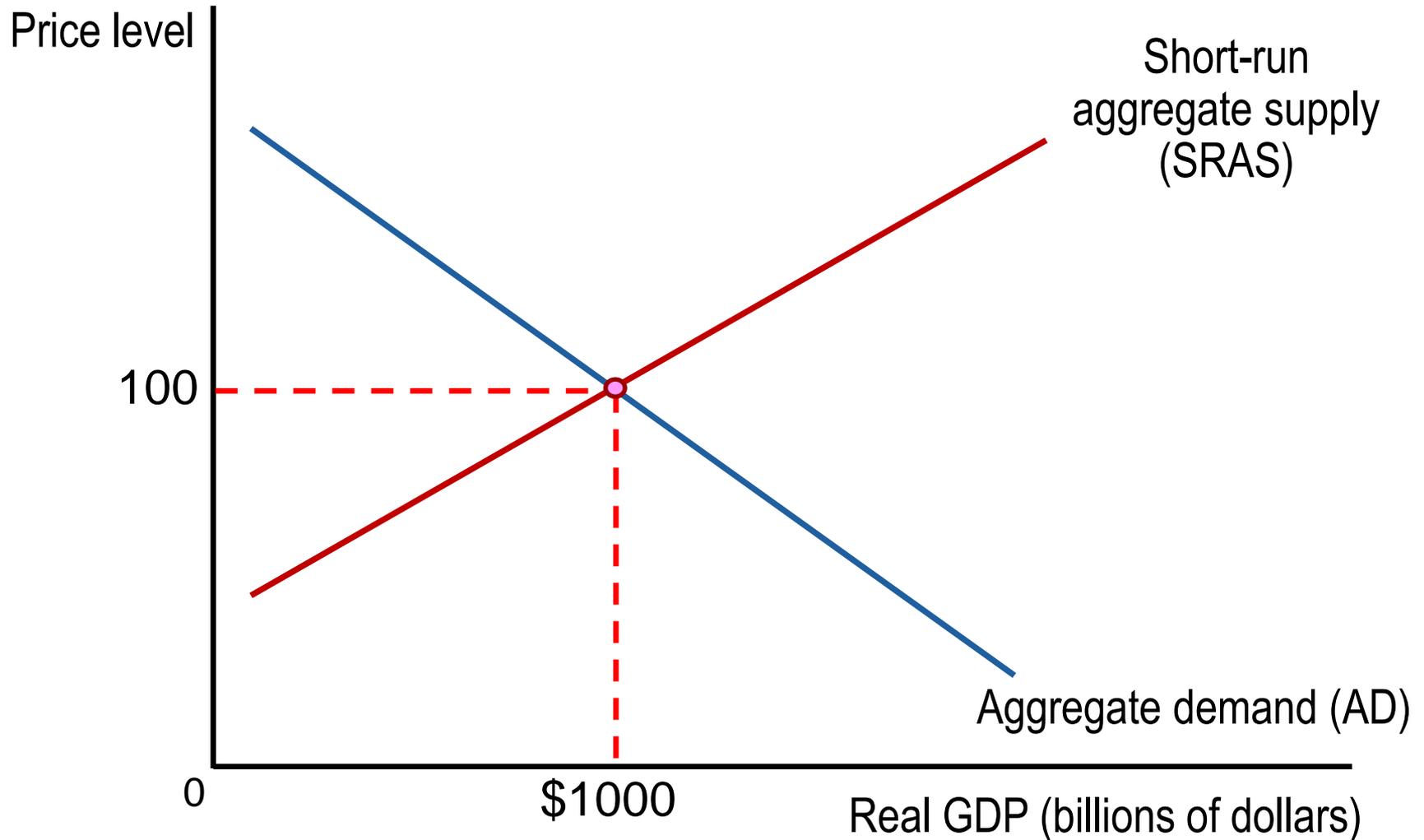
## As with AD and market D, SRAS is different from a market S curve

- A **market supply curve** shows true marginal cost (MC) for producers in a particular market, assuming that input relative prices remain constant.
- As the price of good X rises, a seller is willing to supply more of good X given their MC, yielding an upward slope of the supply curve for good X. We can add up all sellers to get an aggregate market supply (**S** curve) but whatever the scale changes in the price level have no effect on true MC and hence no effect on amount supplied at a given price.
- The **SRAS curve** shows how changes in the price level changes the amount producers in aggregate will offer to the whole economy in the short-run. In the short run, nominal changes can affect sales revenue and induce output changes.

# Macroeconomic equilibrium in the long run and the short run

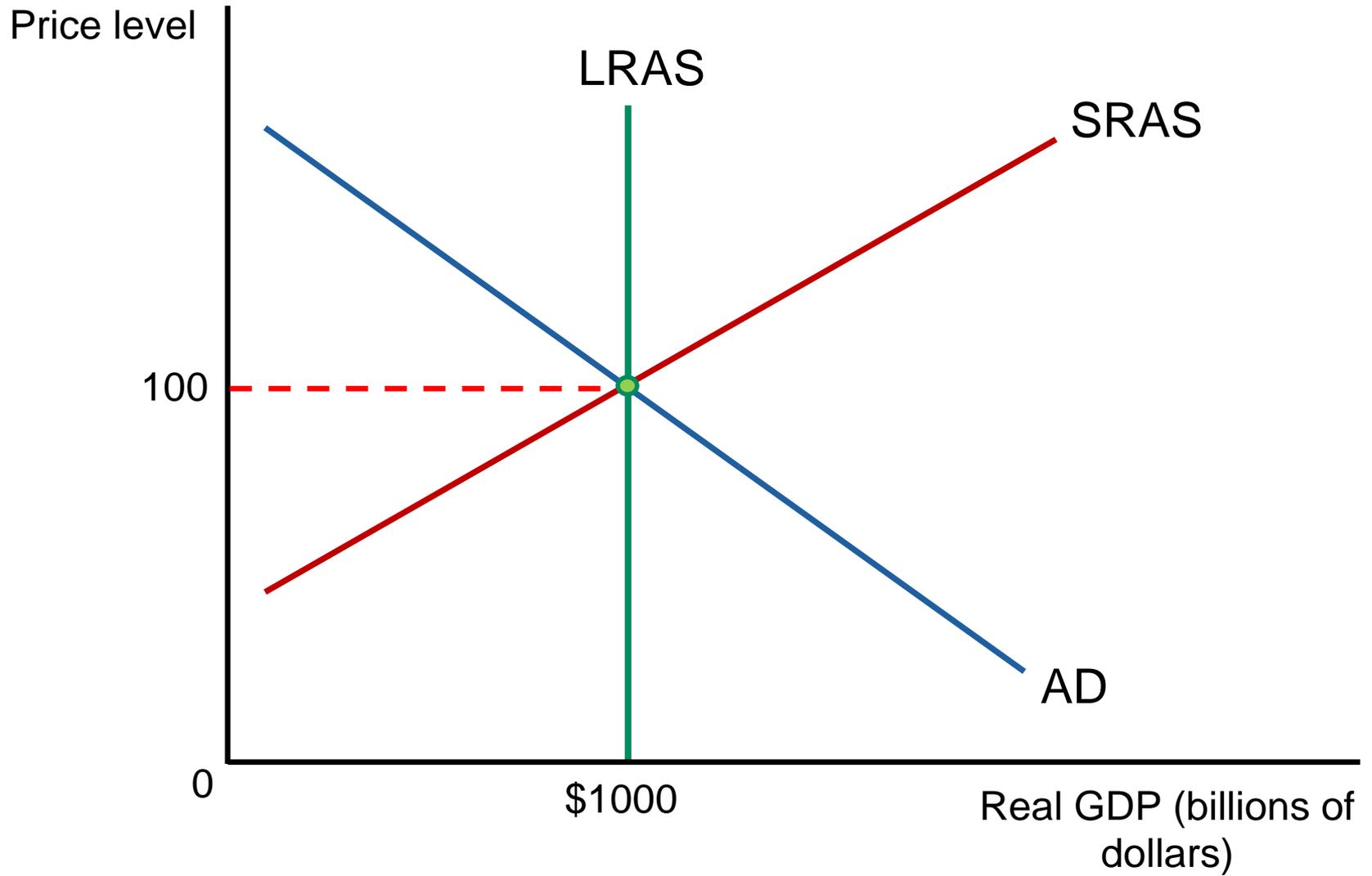
- We now can define the equilibrium condition.
- In long-run equilibrium, the aggregate demand (AD) and short-run aggregate supply (AS) curves intersect at a point along the long-run aggregate supply (LRAS) curve.
- In the short-run, equilibrium is where the SRAS and the AD curve intersect.
- In the long-run case, this equilibrium indicates that short-run actual output is equal to long-run potential output and there is ‘full employment’ and no under- or over-utilized capacity.
- There may well be over- or under-capacity with the short-run equilibrium.

# Aggregate demand and aggregate supply





# Long-run macroeconomic equilibrium



# Interpretation

- In long-run macroeconomic equilibrium, the AD and SRAS curves intersect at a point on the LRAS curve. In our first figure, equilibrium occurs at a real GDP of \$1000 billion and a price level of 100.
- For the second figure, in the short run, real GDP and the price level are determined by the intersection of the AD curve and the SRAS curve. In the figure, real GDP is measured on the horizontal axis, and the price level is measured on the vertical axis. In this example, equilibrium real GDP is still \$1000 billion and the equilibrium price level is still 100.
- Note that for the long-run the Classical Dichotomy holds in equilibrium – the price level is irrelevant. It could be 200, 1000 or 10.
- But in the short-run price level is important in determining real GDP in the short-run.

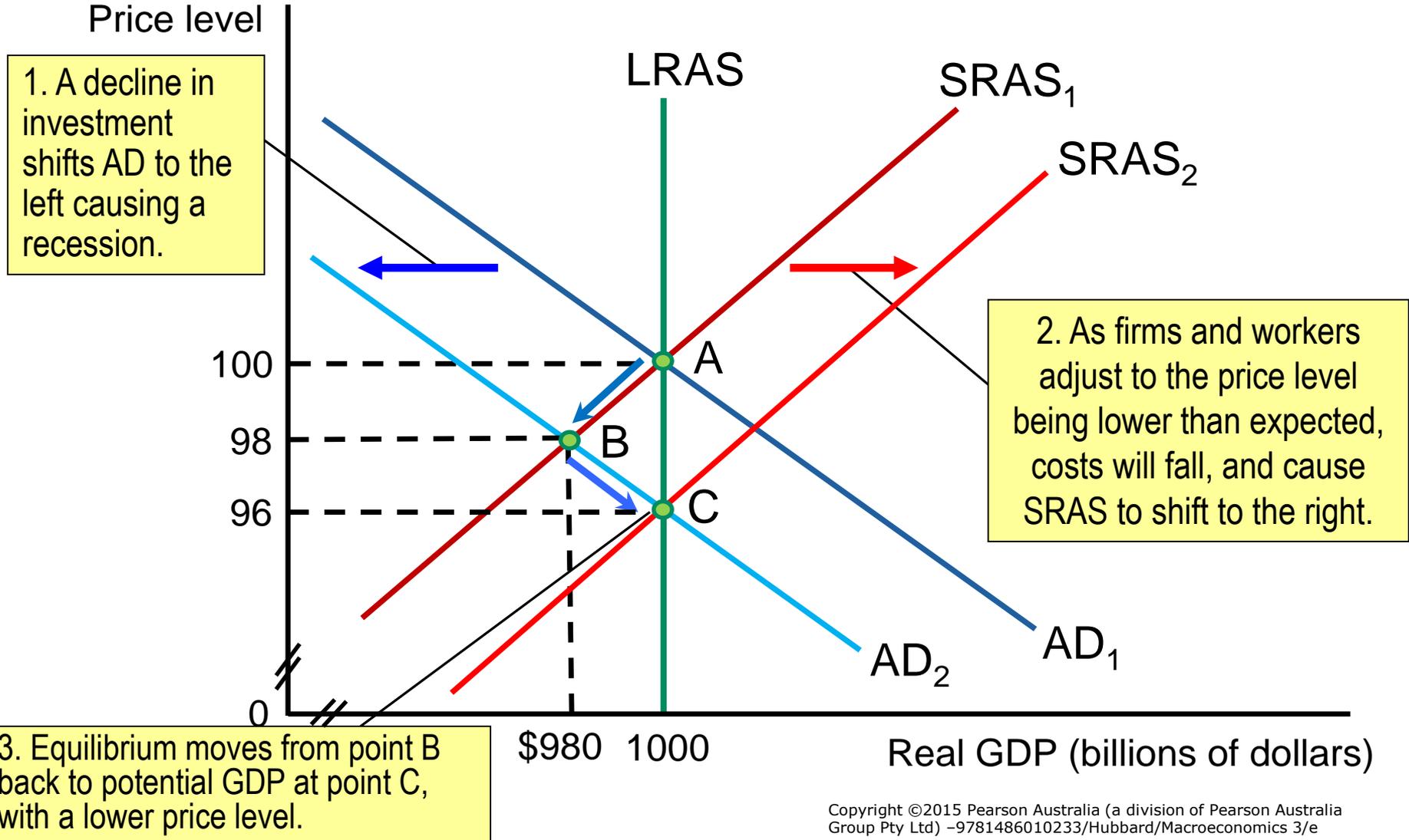
# Macroeconomic equilibrium in the long run and the short run: business cycles

- We can now use this model to analyze business cycles. The following analysis of the aggregate demand and aggregate supply model begins with a simplified case, using two assumptions:
  1. The economy has not been experiencing any inflation. The price level is currently at 100, and workers and firms expect it to remain at 100 in the future.
  2. The economy is not experiencing any long-run economic growth. Potential GDP is at \$1000 billion and will remain at that level in the future.

# Recession

- Assume there is some decline in AD (e.g. I suddenly falls). The short-run effect of a decline in aggregate demand will yield:
  - *AD* curve shifts left, and real GDP declines.
- Adjustment back to potential GDP in the long run.
  - *Automatic adjustment mechanism: SRAS* curve shifts right (which may take several years).

# The short-run and long-run effects of a decrease in aggregate demand



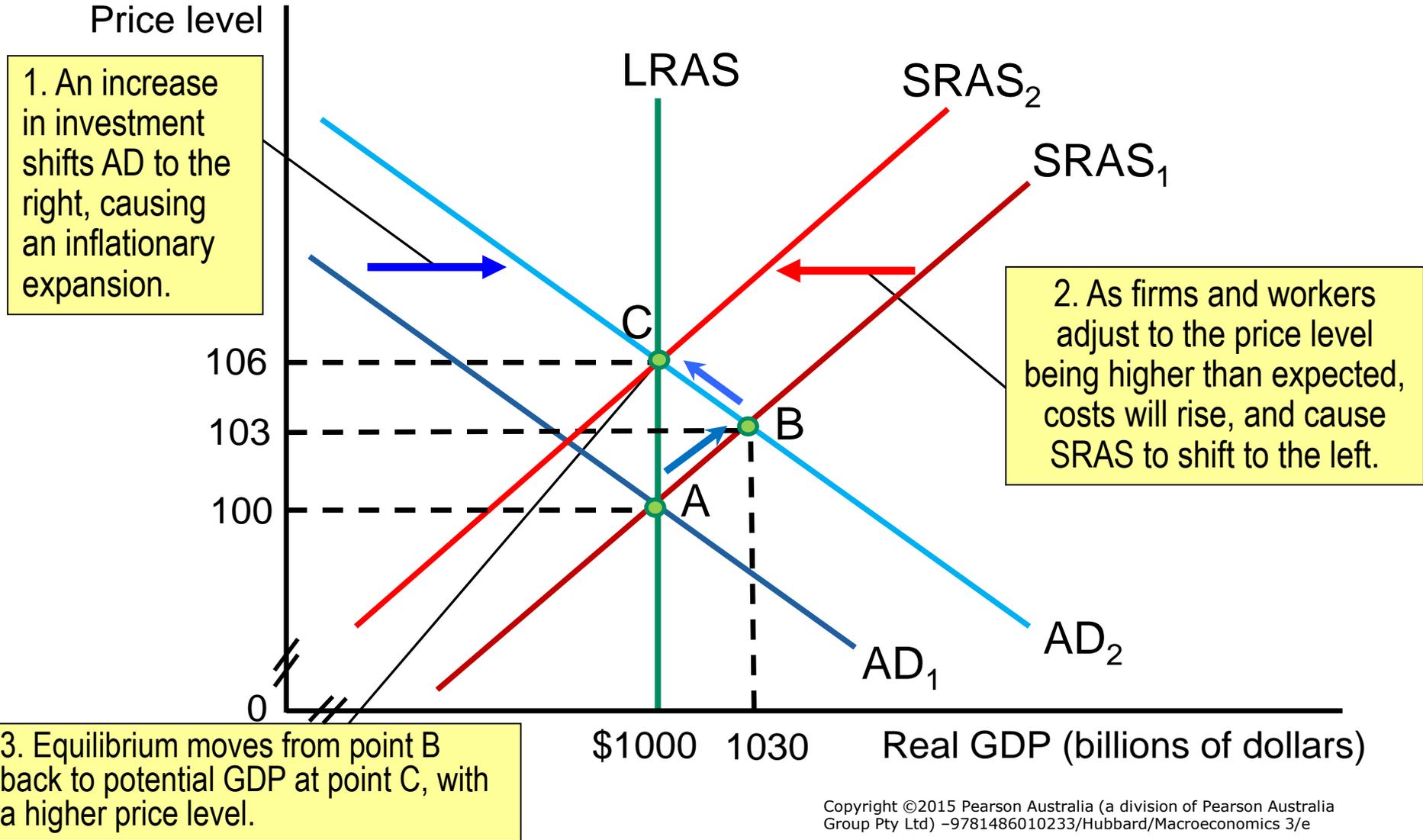
# AS-AD dynamics of our recession graph

- In the short run, a decrease in aggregate demand causes a recession. In the long run it causes only a decrease in the price level.
- The decline in investment shifts aggregate demand from AD1 to AD2. Short-run equilibrium moves from potential GDP at point A to recession at point B.
- The price level of 98 at point B is lower than the price level of 100 that workers and firms had expected. As workers and firms adjust to the lower price level, prices and wages fall, and the SRAS curve shifts from SRAS1 to SRAS2.
- Equilibrium moves from point B back to potential GDP at point C, with a lower price level of 96.
- Note that the long-run structure of the economy is a re-equilibrating force for the short-run.

# Expansion

- Now let's look at the *opposite* scenario of the short-run effect of an increase in aggregate demand.
  - *AD* curve shifts right, and real GDP and the price level rise.
- Adjustment back to potential GDP in the long run.
  - *Automatic adjustment mechanism: SRAS* curve shifts left (which may take a year or more).

# The short-run and long-run effects of an increase in aggregate demand



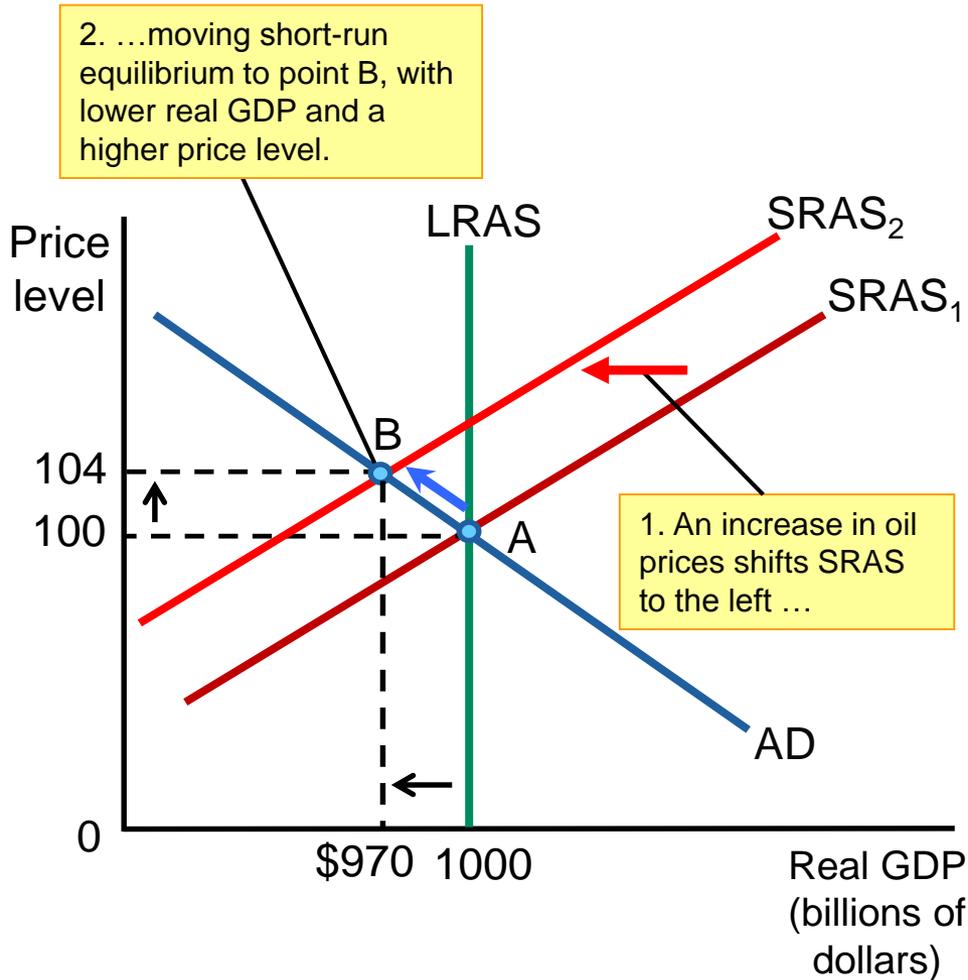
# AS-AD dynamics of our expansion graph

- In the short run, an increase in aggregate demand causes an increase in real GDP. In the long run it causes only an increase in the price level (same assumptions as before).
- The increase in investment shifts aggregate demand from AD1 to AD2. Short-run equilibrium moves from potential GDP at point A to beyond potential GDP at point B.
- The price level of 103 at point B is higher than the price level of 100 that workers and firms had expected. As workers and firms adjust to the higher price level, prices and wages rise, and the SRAS curve shifts from SRAS1 to SRAS2.
- Equilibrium moves from point B back to potential GDP at point C, with a higher price level of 106.

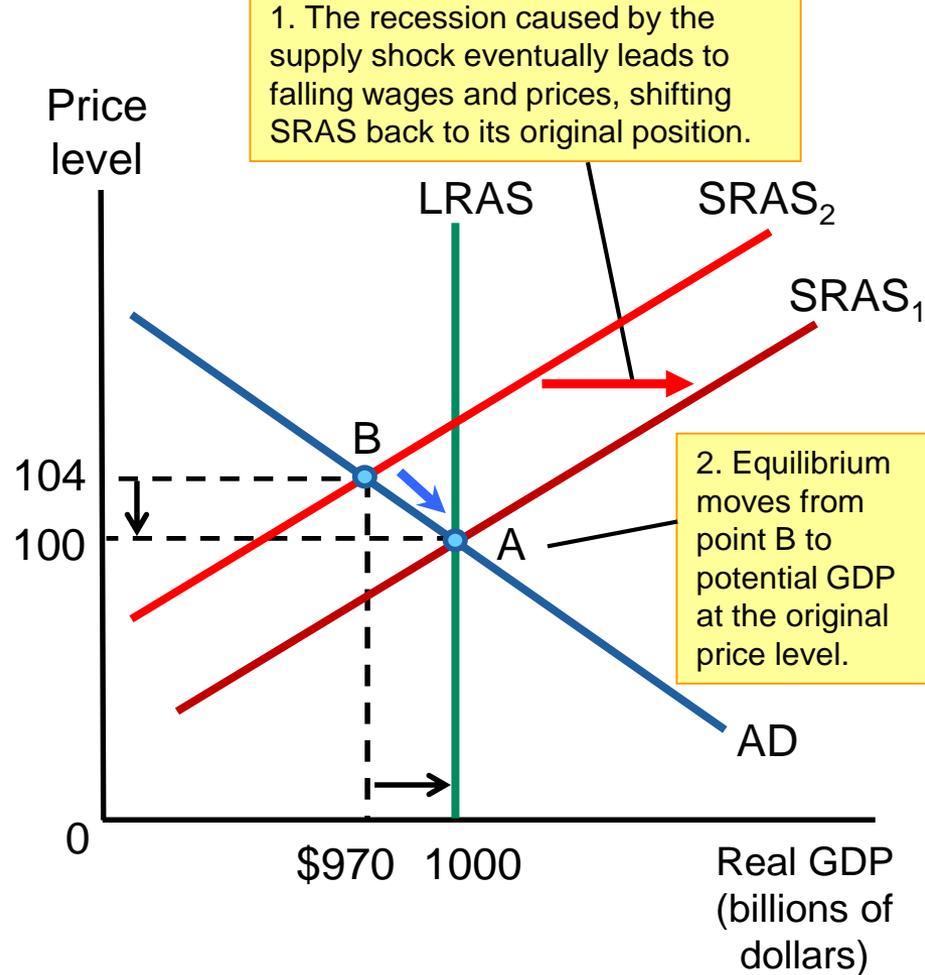
# Supply shock

- A **supply shock** is an unexpected event that causes the short-run aggregate supply curve to shift. If inward, it is a negative shock; if outward, it is a positive shock. The short-run effect of a **negative supply shock**:
  - SRAS curve shifts left, real GDP falls and the price level rises.
- Adjustment back to potential GDP in the long run:
  - SRAS curve shifts right (which may take several years).
- **Stagflation**, (a combination of inflation and recession), usually results from a negative supply shock, at least according to this model.

# The short-run and long-run effects of a supply shock



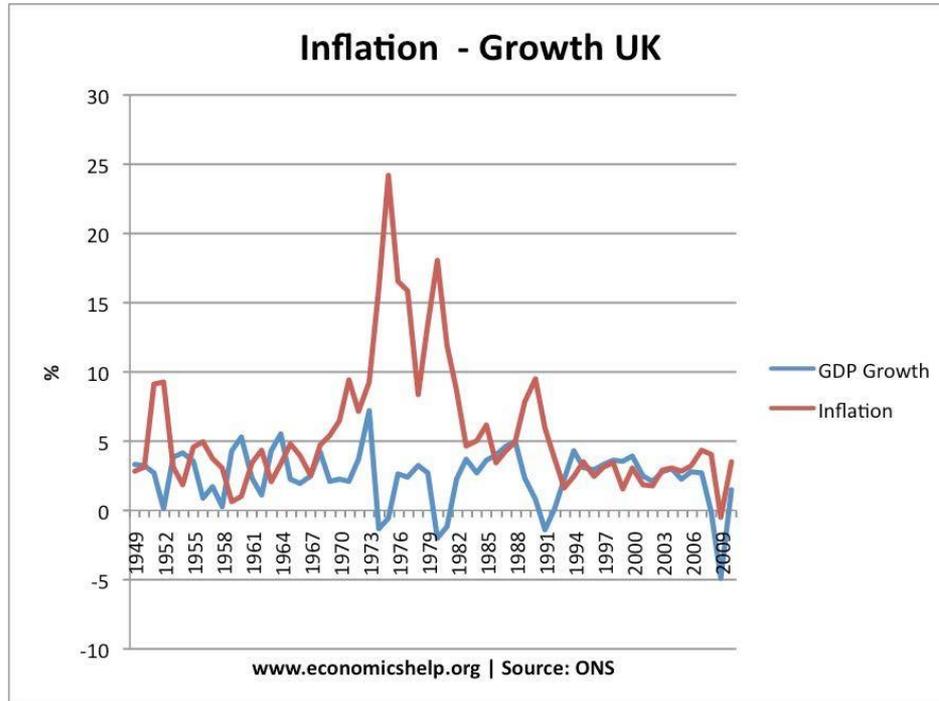
(a) A recession with a rising price level – the short-run effect of a supply shock.



(b) Adjustment back to potential GDP – the long-run effect of a supply shock.

- Panel (a) shows that a supply shock, such as a large increase in oil prices, will cause a recession and a higher price level in the short run. The recession caused by the supply shock increases unemployment and reduces output.
- In panel (b), rising unemployment and falling output result in workers being willing to accept lower wages and firms being willing to accept lower prices. The SRAS curve shifts from SRAS2 to SRAS1.
- Equilibrium moves from point B back to potential GDP and the original price level at point A.

# 'Stagflation'



- We will consider this in more detail later on in the course, but there was, for a couple of decades, a notion that one could not have rising inflation and rising unemployment at the same time – the definition of ‘stagflation’ (*stagnation together with inflation*).
- As our simple model shows, it is possible and the basic explanation for it is some sort of supply shock. This model can thus be applied to the stagflation that gripped much of the developed world in the 1970s.
- For example one can see weak to negative real GDP growth in the UK in the late 1960s and much of the 70s paired with very strong inflation. This shook up the world of macroeconomic thought and policy – as we will see next week.

# The lighter side of stagflation



# Using the model to explain inflation more generally

- The SRAS and AD curves have price levels contained within them.
- AD-AS models can thus show two possible causes of inflation (increases in the rate of change of price levels) caused by shocks.
- (1) *Cost-push inflation* is what we have just illustrated: a rise in costs due to a supply shock and an inward shift of AS.
- (2) *Demand-pull inflation* is what we illustrated earlier with our expansion example: an increase in AD and an outward shift in AD.

## Solved Problem 2

Using the aggregate demand and aggregate supply model

Assume the economy is initially in equilibrium with long-run aggregate supply constant.

Now suppose growing GDP in China and India leads to an increase in demand and higher prices for Australian resources.

Explain both the initial change in equilibrium and the longer-term effect.

## Solved Problem 2

Using the aggregate demand and aggregate supply model

Solving the problem:

- An increase in demand for Australian exports will cause an increase in aggregate demand represented by a rightward shift of the  $AD$  curve. Short-run equilibrium will move beyond potential GDP, causing an increase in the price level.
- The price level is now higher than workers and firms had expected. As workers and firms adjust to the higher price level, prices and wages rise, and the short-run aggregate supply curve shifts inwards to the left.
- Equilibrium moves back to potential GDP, but at a higher price level.

# Simplifying assumption: no feedback loops

- Our simple expositions thus far implicitly assume no long-run growth and *no feedback loop* between price level and the initial shift in the AD curve.
- With feedback loops, the *transition dynamics* (to use the technical term) would be complicated. For example, a first AD shift would affect inflation which would then shift AD again, leading to a series of ‘vibrations’ in the shifts. Introducing these makes for a more complex graph and adjustment process and will lead to a different calculated equilibrium real output/price level. The basic dynamics, though, would not change. Relaxing these assumptions allows for more precise predictions and robust simulations of real GDP and price level dynamics.
- Similarly, for long-term growth: the LRAS will also be shifting, making for more complexity but more realism.

# A dynamic AD-AS model

So let's relax these simplifying assumptions now to get a dynamic aggregate demand and aggregate supply model.

Three changes to the basic model will now be made, relaxing the assumptions we made earlier and now incorporating more complex transition dynamics:

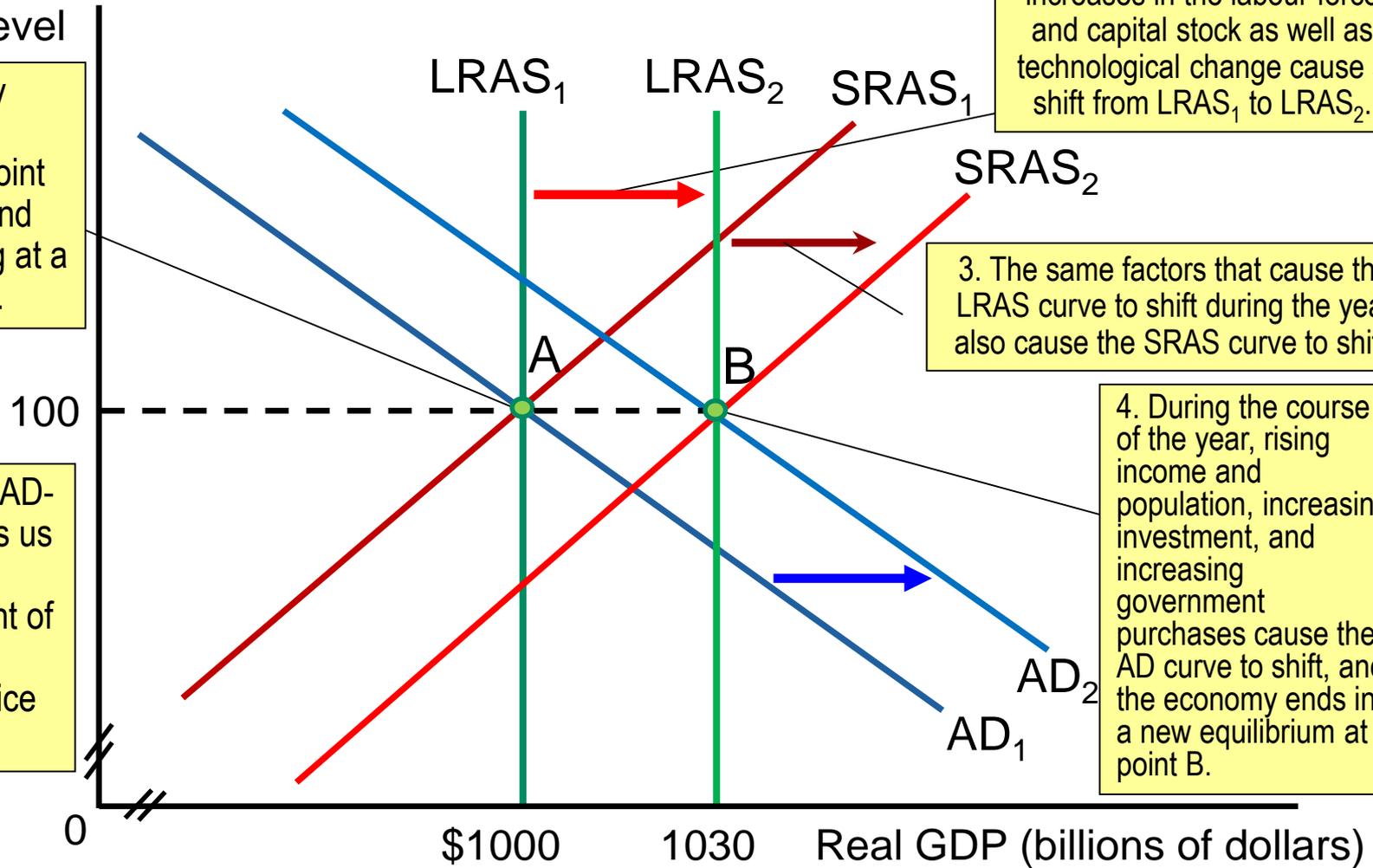
1. Potential GDP increases continually, shifting the *LRAS* curve to the right.
2. During most years the *AD* curve shifts to the right.
3. Except during periods when workers and firms expect high rates of inflation, the *SRAS* curve shifts to the right.

# A dynamic aggregate demand and aggregate supply model

Price level

1. The economy begins in equilibrium at point A with  $SRAS_1$  and  $AD_1$  intersecting at a point on  $LRAS_1$ .

5. The dynamic AD-AS model allows us to give a more accurate account of changes in real GDP and the price level.

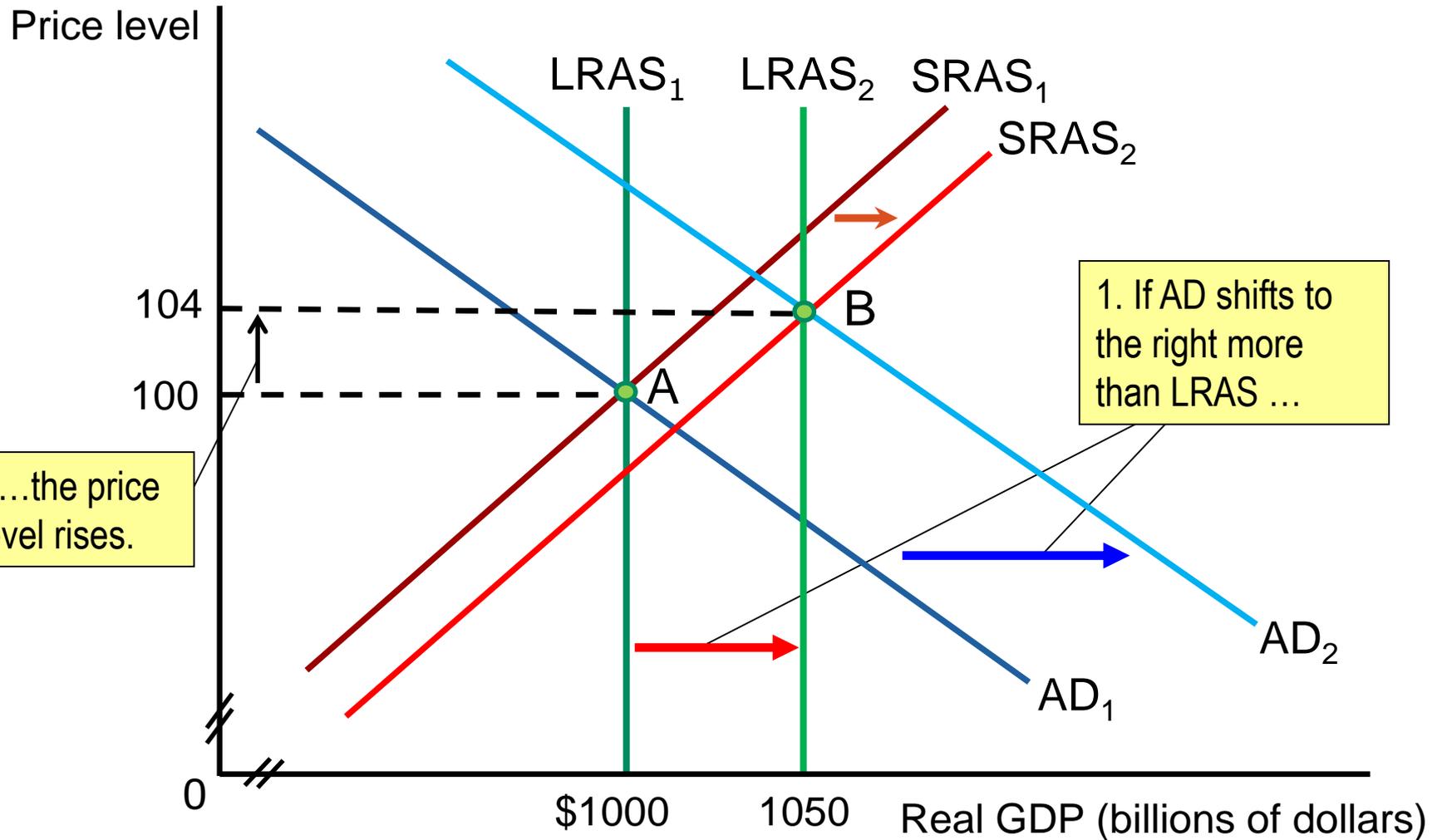


2. During the course of a year, increases in the labour force and capital stock as well as technological change cause a shift from  $LRAS_1$  to  $LRAS_2$ .

3. The same factors that cause the LRAS curve to shift during the year also cause the SRAS curve to shift.

4. During the course of the year, rising income and population, increasing investment, and increasing government purchases cause the AD curve to shift, and the economy ends in a new equilibrium at point B.

# Using dynamic aggregate demand and aggregate supply to understand inflation



## Analysing the dynamics

- **First figure:** In the dynamic model, increases in the labour force and capital stock as well as technological change cause long-run aggregate supply to shift over the course of a year, from LRAS1 to LRAS2. Typically these same factors cause short-run aggregate supply to shift from SRAS1 to SRAS2. Aggregate demand will shift from AD1 to AD2 if, as is usually the case, spending by consumers, firms, and the government increases during the year.
- **Second figure:** The most common cause of inflation is total spending increasing faster than total production. The economy begins at point A, with real GDP of \$1000 billion and a price level of 100. An increase in potential GDP from \$1000 billion to \$1050 billion causes LRAS to shift from LRAS1 to LRAS2. Aggregate demand shifts from AD1 to AD2. Because AD shifts to the right by more than the LRAS curve, the price level in the new equilibrium rises from 100 to 104.

# “Keynesian” AD-AS

- The AD-AS model we are studying has ‘Keynesian’ roots.
- We’ve already seen the relationship between AE and AD and the fact that AD slopes downward because of macro effects on  $C+I+G+NX$  through changes in the price level.
- In this synthesis model (AD-AS) there are actually some quite complex monetary-real dynamics and interactions that are not fully described analytically or explained, though we do put out some plausible explanations for the effects. Particularly complicated is the role of money – cash – in consumer behaviour. We have spoken of wealth effects (which is sometimes called the *Pigou Effect* after the neoclassical economist A.C. Pigou).
- But Keynes went further to say that as the price level falls, the real value of money balances held increases, increasing real purchasing power of consumers stimulating  $C$ . Money is a form of wealth but much more tied to daily transactions.

- Here is what Keynes himself said in the General Theory about the relationship, in aggregate, between supply and demand:
- “...the classical economists have taught that supply creates its own demand; —meaning by this in some significant, but not clearly defined, sense that the whole of the costs of production must necessarily be spent in the aggregate, directly or indirectly, on purchasing the product.”
- Keynes then recasts this logic to say that “..supply creates its own demand in the sense that the aggregate demand price is equal to the aggregate supply price for all levels of output and employment.”

# Says Law

- Classical economists, using a concept called Says Law (named after Classical Economist Jean-Baptiste Say), held that whatever was produced would be consumed, mainly because of circular flow (i.e. factors are paid to produce and they will spend what they earn to buy that total output).
- Keynes summarised this as “Supply creates its own demand” (though Say himself did not use this phrase).
- But Keynes argued that supply is largely driven by the expected extent of future demand, at least in many circumstances and thus held that demand creates its own supply. In other words if suppliers mis-estimate future aggregate demand it is possible that some output might remain unconsumed – a ‘*general glut.*’

- The AD-AS model is a *synthesis* of Keynes views and neoclassical models in several senses:
- (1) It is assumed the long-run equilibrium will always hold (neoclassical view) but that short-run deviations are possible and must be explained (inspired by Keynes).
- (2) Money is neutral in the long-run (neoclassical) but not in the short-run (inspired by Keynes but now accepted for different reasons by differing and even opposing schools – Keynesian, Neo-Keynesian, New Classical)
- (3) Both (aggregate) ‘supply’ (SRAS) and ‘demand’ (AD) determine output in the short-run (Keynesian) but only supply (LRAS) determines output in the long-run (neoclassical – Say’s Law holds).
- (4) Economic agent expectations (C and I) have short-run impact on output and prices (Keynesian) but not in the long run (neoclassical).

# Poles of opinion

- This sets us up for our potted history of macroeconomic thought next week. Oversimplifying, current macro-economics can be seen as split into two camps:
- (1) There are those who believe Says Law, neutrality of money and equilibrium generally holds – in the long-run always but sometimes even in the short-run.
- (2) Those who dispute this – sometimes even in the long-run.
- And there is whole range of attitudes in between.
- Post-GFC we seem to be operating in an overall Keynesian intellectual framework with multiple strains of other models thrown in. We will consider the evolution of this thought in more detail next week.