Aggregate Output, Prices and Economic Growth

Abstract

Keywords
Keyword1 — Keyword2 — Keyword3

12a	Calculate and interpret price, income and cross-price elasticities of demand and describe factors that affect each measure
12b	Compare substitution and income effects
12c	Distinguish between normal goods and inferior goods
12d	Describe the phenomenon of diminishing marginal returns
12e	Determine and interpret breakeven and shutdown points of production
12f	Describe how economies of scale and diseconomies of scale affect costs

Contents

1. Aggregate Demand

The aggregate demand curve looks like the ordinary demand curves from microeconomics where the law of demand still holds: quantity demanded increases and price levels decline. The intuitive understanding of price levels is the number of goods one is able to afford with a given level of income. In this scope, interest rates and inflation are a measure of price levels and GDP/GDI is a proxy for income levels.

$$Expenditure = C + I + G + (X - M) \tag{1}$$

Rearranging this equation, we have:

$$(S - I) = (G - T) + (X - M) \tag{2}$$

where where we consider 3 components: savings-investment differential $(S-I)$, fiscal balance $([G-T])$ and trade balance $(X-M)$ and a fundamental relationship between the 3 components.

- **Fiscal Deficit [**$(G-T) > 0$**]** implies (a) private sector must save more than what it invests ($[S-I > 0]$), (b) the country must run a trade deficit ($[X-M] < 0$) with corresponding flow of foreign savings
- **Trade Deficit** ($[X-M] < 0$) implies (a) domestic private savings are being supplemented by inflows of foreign capital (b) foreign economies are building up financial claims over the domestic company

The **twin deficits** is an hypothesis which states that large fiscal deficits are correlated with large trade deficits as even to a causation relationship (large fiscal deficits cause large trade deficits).
The underlying theory assumes that government cuts back taxes in order to boost consumption increasing domestic fiscal deficit. The increased spending reduces savings rate forcing domestic economies to borrow from foreign economies. At the same time, because consumption increases, imports increase as well contributing to a larger trade deficit. (the **current account** is the trade balance account $current_acc = (S-I) - (G-T) = (X-M)$)

Why do fiscal deficits reduce investment?

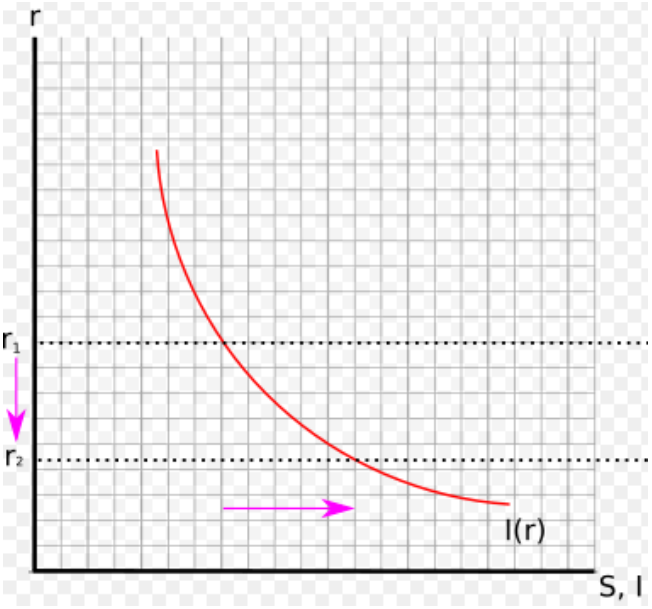

Figure 1. Investment, Savings as function of real interest rates

Fiscal deficits run on government debt and consequently government debt competes with corporate debt to access funds in the money market. This increased competition for credit increases interest rates and results in lower investment levels. This is know as the **crowding out** effect.
Increased interest rates also increase private saving, reduce consumption specially in durable goods and increase the money flowing into money markets as result. It also tends to attract foreign investors.

Consumption function

$$C = C(Y - T(Y)) \tag{3}$$

The consumption as function of the disposable income of the private sector (Y). Disposable income equals income minus net taxes.

- **Marginal Propensity to Consume (MPC)** is the portion of additional consumption per additional unit of disposable income
- **Marginal Propensity to Save (MPS)** is the portion of additional saving per additional unit of disposable income
- **Average Propensity to Consume (APC)** is the ratio between total consumption and total income

These are useful to gauge how sensible is the economy to changes in disposable household income. Countries with a higher APC may be more sensible to changes in economy as their savings are lower. For countries with more APC, macroeconomic policies that increase disposable income would have a greater impact on the final consumption than countries with lower APC ratios.

$$MPC + MPS = 1 \tag{4}$$

In modern economy, consumption is not only a function of Income but also depends on wealth. This is specially true in sophisticated economies where individuals possess wealth.

Investment function

$$I = I(r, Y) \tag{5}$$

Investment is a function or real interest rates (r), which is a proxy of the cost of funding and aggregate income (Y) which is a proxy of expected profitability (whether the economy expands and how much). In periods of recession, aggregate demand decreases reduce investment levels and aggregate output and vice-versa.

Government

$$Fiscal_{balance} = G_S - t(Y) \tag{6}$$

The government includes the government spending (G) and its revenues (t(Y)). We consider both government spending and taxes *exogenous policy variables*, meaning any change in aggregate demand must require adjustments from the private sector and foreign trade balance mainly, in order to maintain balance.
The **automatic stabilizer effect** describes the effect in which fiscal balance and aggregate income are inversely proportional in the sense (1) Aggregate Income increases -¿ Increase tax revenue -¿ Lower fiscal balance defit or (2) Aggregate Income decreases -¿ Decrease in tax revenues -¿ Higher fiscal balance deficit
This effect stabilizes the aggregate output because they have an inbuilt relation that offsets any fluctuation in economic activity, mitigating such effects.

Trade Balance

Net exports are mainly a function of income in the domestic economy and rest of the world economies.

- Increases in domestic income vs rest of the world results in more demand for foreign products and increased trade deficit (more imports, less exports)
- Increases in rest of the world income vs domestic results in lower demand for foreign products and decreased trade deficit (less imports, more exports)

IS curve

The IS curve shows the causation from interest rates to planned investment and savings to national income and output. An increase in interest rates results in an increase in savings and decrease in investments. When considering the real GDP resulting from the aggregate expenditure model, increased interest rates results in a decrease in aggregate demand, by increasing savings and decreasing investment and consumption.

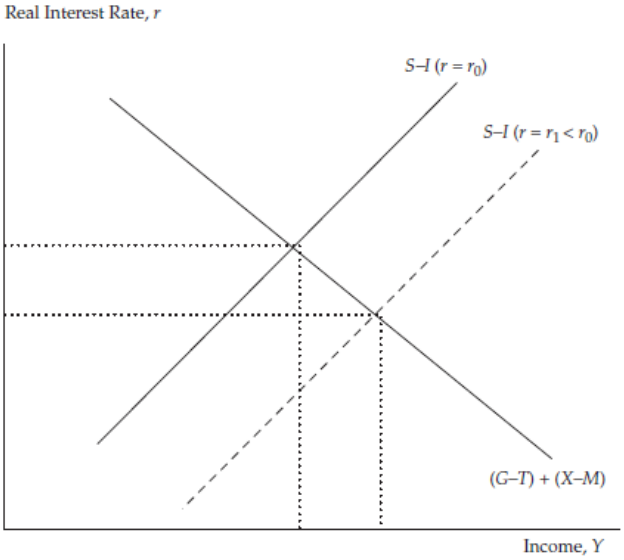

Figure 2. IS curve

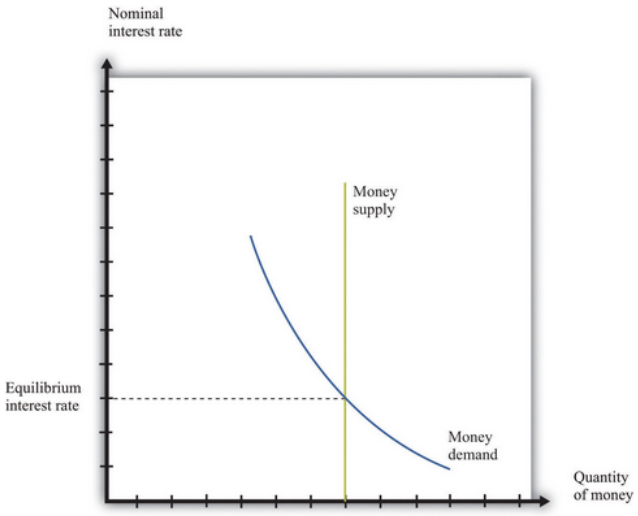

Figure 3. LM curve

2. Money Market: The LM curve

The LM curve (Liquidity-Money) represents the combinations of the interest rate and income such that money supply and money demand are equal. The interest rate represents an opportunity cost of holding money. When interest rates are higher, money is less effective as a store of value.
The demand for money derives essentially from:

- *Transaction demand for money*: includes (a) the willingness to hold cash for everyday transactions and (b) the demand for money as a precautionary measurement

- *Speculative demand for money*: this is the willingness to hold cash instead of securities as an asset for investment purposes. Interest rates are opportunity costs of holding money for speculative investments and thus, as interest rates rises, the speculative demand for money decreases

The equation of the money supply (LM curve), real money supply equals quantity of demand for real money:

$$\frac{M}{P} = L(i,Y) \tag{7}$$

Quantity Theory of Money

The quantity theory of money provides a framework to relate the nominal money supply (M), the price level (P) and real income/expenditure.

$$MV = PY \tag{8}$$

It states the velocity of money (V) multiplied by the nominal money supply (M) (essentially MV is the flow of money as in fluid dynamics) equals the price level (P) multiplied by the aggregate expenditure where PY is the nominal value of GDP (Y is the real GDP, P is the inflation). M/P is the real money supply.
The demand for money is a function of real income and a decreasing function of the interest rate because the higher the interest rates are, the more likely people are to shift liquid deposits into higher yield securities.

Equilibrium in IS-LM model

We can combine LM and IS models because they are both function of interest rates and aggregate output. Solving these two equations jointly yields the equilibrium points of output and interest rates (r*, Y*).
The IS curve results from the condition of stability where aggregate expenditure equals aggregate income. LM curve results from the theory of money equation.

$$L(i,Y) = C(Y - T(Y)) + I(r,Y) + G \tag{9}$$

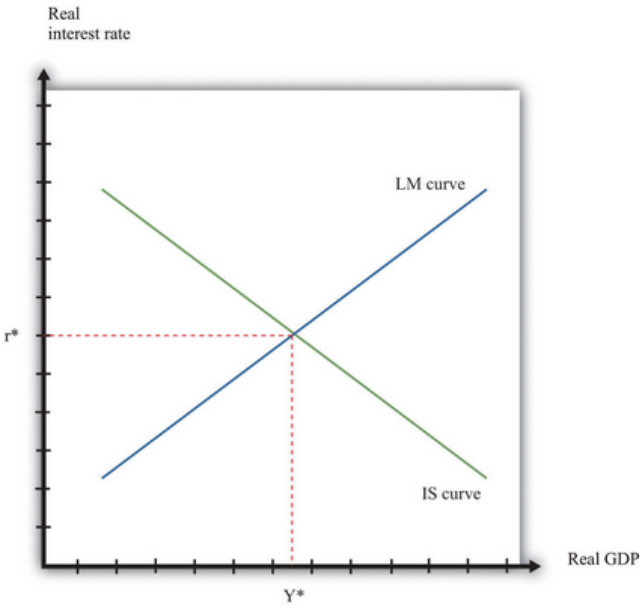

Figure 4. Equilibrium in LM-IS curve

Comparative statics

We consider two key exogenous factors in this model: (a) level of autonomous spending, (b) real money supply. Increase in autonomous spending (which is the amount of spending which doesn't depend on interest rates) will shift the IS curve outward, while a decrease pushes it inward. One source of changing autonomous spending is through fiscal policies and government spending.

An increase in government spending and fiscal deficits pushes IS curve outward.

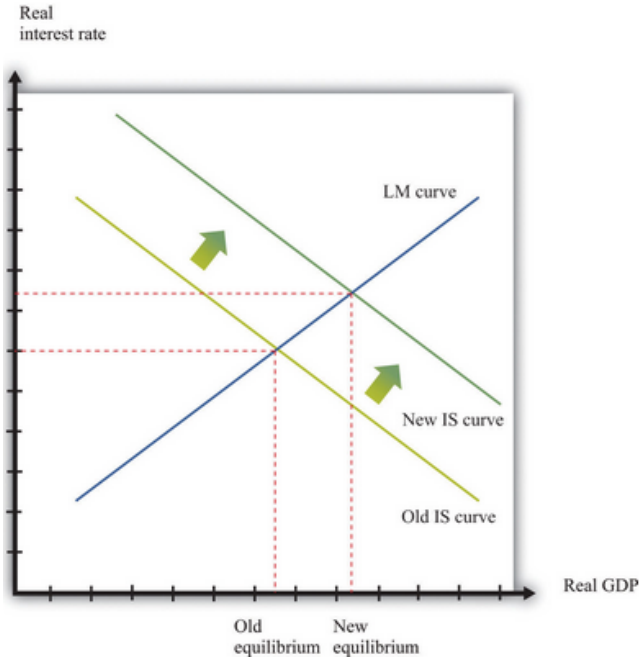

Figure 5. Shift in IS curve from increased autonomous spending

The variations in money supply:

- If the money supply decreases, the LM curve translates upward: there is less liquidity as money is more scarce increasing interest rates and lowering output
- If the money supply increases, the LM curve translates downward as there is more liquidity, interest rates are lower and real GDP is higher

Aggregate Demand Curve

If the nominal money supply (M) is held constant, an increase in price level leads to a decline in real income and an increase in the real interest rate. That is, if price levels increase, the consumers will be able to afford less with the same level of income or, conversely, will have to pay more for the same quantity of goods. This, in turn, decreases the real money supply (M/P), increasing interest rates.

The **aggregate demand curve (AD curve)** is the inverse relationship between price level and real income.

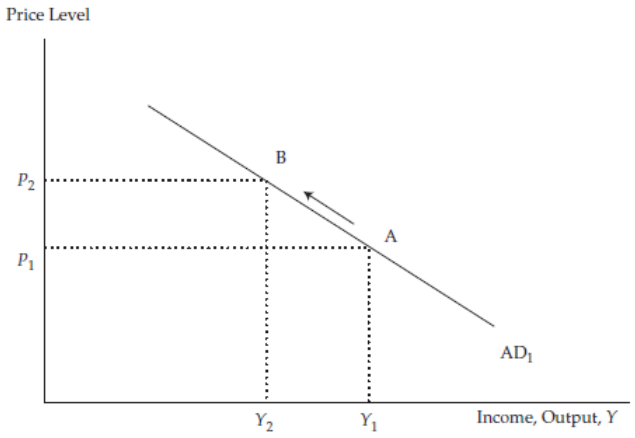

Figure 6. Aggregate Demand Curve

The slope of the AD depends on the sensivities of investment, saving and money demand to income and the interest rate.

Aggregate Supply Curve

The aggregate supply curve represents the willingness of producers to supply the economy provided various price levels. For this matter, there are 2 AS curves: *Long run curves* emphasizing long run cost structures and expectations, and *short run curves*.

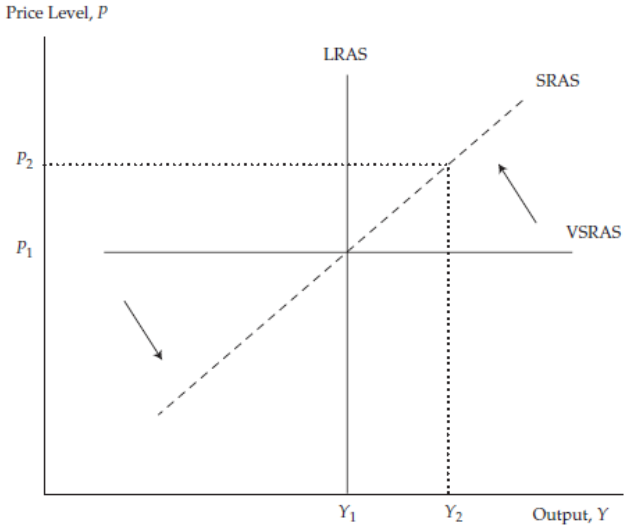

Figure 7. Very Short Run Aggregate Supply (VSRAS), Short Run Aggregate Supply (SRAS) and Long Run Aggregate Supply (LRAS)

In the very short run, companies facing stronger demand than expected increase their capacity, increase labor hours and increase the overall intensity of capital means. When demand decreases, companies reduce capacity and cut back hours worked. (change in demand don't result in change in price levels because firms have some operating flexibility to deal with fluctuations in demand)
In the short run, as price levels rise, most companies enjoy higher profit margins because of such cost inflexibility. A lot of costs are locked under multiple period contracts, like wage contracts with unions, the price of some raw materials can also be fixed for the duration of a contract among other input costs, making them rather inflexible in the short-run. (change in price levels result in increased output, because change in revenue ¿ change in costs -¿ positive economic profits - SRAS)
However, if price levels fall, companies can also see their profits squeezed.
In the long run, all businesses costs are variable. Overtime, these inflexible costs tend to catch up with the prices of final goods achieving a natural equilibria of normal economic profits. Consequently, over the long run, when price levels change, wages and costs change proportionally having no impact in aggregate supply (change in price levels results in the same output level, because change in revenue = change in costs -LRAS)
The long run equilibrium is referred as the full employment or natural employment level of output. At this level, the macroeconomy is operating at an efficiency frontier and unconstrained level of production. That is, companies have enough spare capacity to avoid bottlenecks, but not excessive capacity to the point where it becomes inefficient and there is a stable pool of unemployed workers looking for and ready to transition into new jobs.

Shifts in Aggregate Demand and Supply

- What causes and economy to expand or contract?
- What causes inflation and changes in the level of unemployment?
- What determines an economy's rate of sustainable growth and how can it be measured?

Shifts in Aggregate Demand

- Household Wealth & Household Disposable Income
- Consumer and business expectations
- Capacity utilization
- Monetary policy
- Exchange Rates
- Growth in Global Economy
- Fiscal Policy (Government/autonomous spending and taxes)

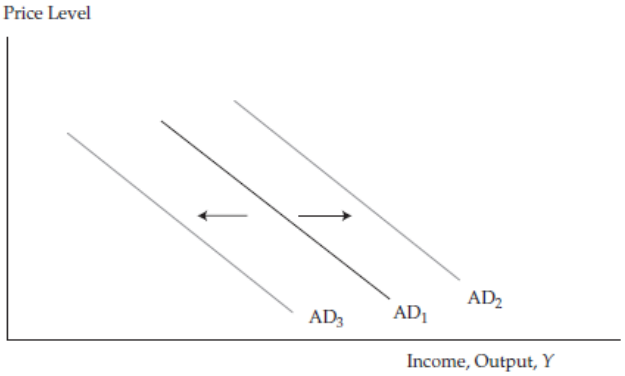

Figure 8. Shifts in the Aggregate Demand Curve (expanding AD_1 to AD_2, contracting AD_1 to AD_3)

Household Wealth includes the value of financial assets (cash, savings, investment securities, pensions) and real assets (real estate). An increase in wealth, either by appraisal of their assets or increased household disposable income, tends to reduce saving rates and boost spending rates as households are confident they will be able to meet their wealth accumulation goals.
As a result, when wealth increases, the aggregate demand shifts right to greater Aggregate Demand/Expenditure per the same price level. When wealth decreases, aggregate demand shifts left.
This is referred as the **wealth effect** and it's a explanation of how equity markets affect real economic activity. Higher equity markets increase household wealth, which induces growth in expenditure. The housing levels can also have a similar effect from valuation (or devaluation).

Consumer and Business Expectations Psychology plays an important part in business and consumer spending. Consumer confidence is tied to expectations regarding their future: the future income, stability and safety of their jobs, etc. When consumers feel confident and have a positive outlook on the future, they are more likely to spend and save less. When consumers feel worried about the future, they become less confident, deferring expenditure in order to save.

Capacity Utilization Capacity utilization is a measure of how fully an economy's production capacity is being used. Companies with excess capacity have little incentive to increase investment in new PPE. In contrast, when companies are operating beyond efficient levels of capacity utilization, there is a need to increase investment spending in order to expand production and avoid bottlenecks.
An increased investment boosts expenditure and real aggregate demand and supply, shifting AD curve to the right. If capacity utilization exceeds production targets, it has the negative effect.

Fiscal Policy Fiscal policy is the use of taxes and government spending to affect the level of aggregate expenditure. An increase in government spending shifts AD curve to the right whereas a decrease in government spending shifts AD to the left.
Lowering taxes will increase the portion of personal income and corporate profits, increasing customer spending and business investment.

Monetary Policy Monetary policies can either (1) target securities such as bank securities, corporate and government bonds (2) lower the require reserve ratio (fractional reserve system) or (3) reduce its target for the interest rates at which banks borrow and lend. These would all increase the availability of money and increase money supply.
An increase of money supply, shifts the AD curve to the right so that each price level corresponds to a higher level of income and expenditure. The more money is available and the less interest rates are, the more likely consumers are to consume durable goods, buy financial assets or real assets and companies are to invest. In the short run, companies will start adjusting to this increased demand. As households have more money than they used to, this shocks the demand curve for products: firms are no longer operating in an equilibria where demand equal supply, so they eventually scale up prices to meet the equilibrium point (LRAS). (inflation equals P_4-P_1)

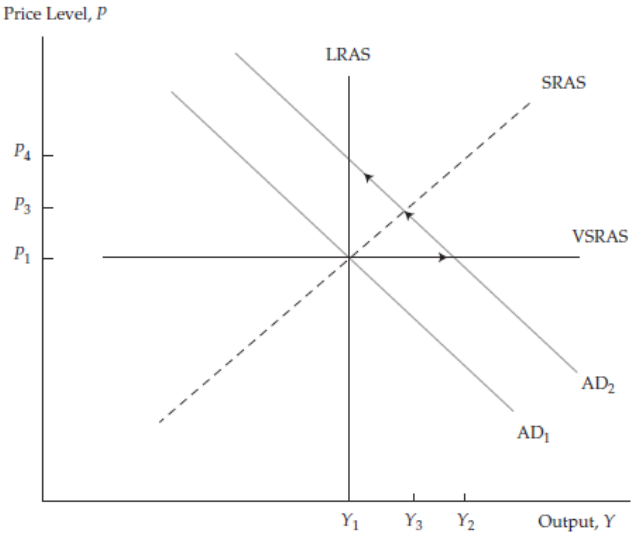

Figure 9. Effect of expanding monetary policy: VSRAS real output, in the long term real output is independant of price levels

Exchange Rate Exchange rates affect the price of imports and exports and thus aggregate demand and supply. Lower currency relative to rest of the world boost exports and causes imports to decline, conversely, higher currency relative to rest of the world boost imports and reduces exports. As exports increase, the AD curve shifts right.

Growth in the Global Economy Increase in International Trade and global economies increases exports to foreign markets, and the relative wealth of overseas economies increase. This shifts the domestic aggregate demand to the right.

An Increase in the Following Factors:	Shifts the AD Curve:	Reason:
Stock prices	Rightward: Increase in AD	Higher consumption
Housing prices	Rightward: Increase in AD	Higher consumption
Consumer confidence	Rightward: Increase in AD	Higher consumption
Business confidence	Rightward: Increase in AD	Higher investment
Capacity utilization	Rightward: Increase in AD	Higher investment
Government spending	Rightward: Increase in AD	Government spending a component of AD
Taxes	Leftward: Decrease in AD	Lower consumption and investment
Bank reserves	Rightward: Increase in AD	Lower interest rate, higher investment and possibly higher consumption
Exchange rate (foreign currency per unit domestic currency)	Leftward: Decrease in AD	Lower exports and higher imports
Global growth	Rightward: Increase in AD	Higher exports

Figure 10. Summary of the causes in shifting aggregate demand

Shifts in Short-Run Aggregate Supply

Factors that change the cost of production or expected profit margins causing the SRAS curve to shift.

- Nominal wages
- Input prices
- Expectations about future overall price level
- Business taxes and subsidies

- Exchange rates

Change in nominal wages Changes in nominal wages shift the SRAS because wages are often the biggest components of companies cost structure and thus, increasing wages results in increased production costs. Rising nominal wages increase price levels and decrease consumption consequently shifting SRAS to the left and decreasing output. In the long-run, nominal wage changes have no impact on LRAS.

Change in input prices The price of raw materials and production factors are essential components of cost in almost every industry. Lower prices reduce the cost of production, which reduces the output prices increasing consumption for a lower price level. Conversely higher input prices increase production costs which incentivizes companies to increase output prices in order to maintain margins, reducing consumption and output. This shifts SRAS to the left.

Change in business taxes and subsidies Higher business taxes increase production costs per unit and shifts AD curve to the left. Business subsidies, on the other hand, decrease unit production costs and shift SRAS to the right.

Shifts in Long-Run Aggregate Supply

The LRAS is determined by the potential production output within an economy - the **potential GDP**. The potential GDP measures the productivity capacity within an economy and the level of real GDP that can be produced at full/natural employment given the capital investment and technological level. Potential GDP increases steady and slowly as the economy production capacity increases from the increase productivity and technology feasibility, supply of physical capital, increase of human capital and quality of the labor force, etc.

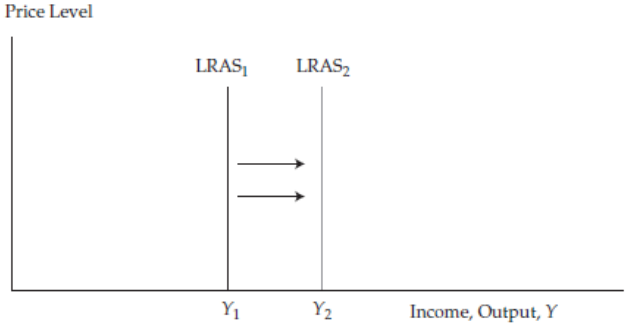

Figure 11. Shifts in the Long Run Aggregate Demand Curve

An Increase in	Shifts SRAS	Shifts LRAS	Reason
Supply of labor	Rightward	Rightward	Increases resource base
Supply of natural resources	Rightward	Rightward	Increases resource base
Supply of human capital	Rightward	Rightward	Increases resource base
Supply of physical capital	Rightward	Rightward	Increases resource base
Productivity and technology	Rightward	Rightward	Improves efficiency of inputs
Nominal wages	Leftward	No impact	Increases labor cost
Input prices (e.g., energy)	Leftward	No impact	Increases cost of production
Expectation of future prices	Rightward	No impact	Anticipation of higher costs and/or perception of improved pricing power
Business taxes	Leftward	No impact	Increases cost of production
Subsidy	Rightward	No impact	Lowers cost of production
Exchange rate	Rightward	No impact	Lowers cost of production

Figure 12. Summary of factors shifting AS curve

Equilibrium AS/AD, equilibrium GDP and prices

We consider 4 possible types of macroeconomic equilibrium:

- Long-Run full employment
- Short-run recessionary gap
- Short-run inflationary gap
- Short-run staglation

Long-run equilibrium

In the long run, equilibrium occurs when AD curve intersects SRAS curve. At this point, both labor and capital are fully employed: every profitable investments are in place given the investing potential within a country (investment opportunities and investment means) and everyone who wants a job as one (excluding transitory unemployment).
In the long run, equilibirum GDP is equal to potential GDP.

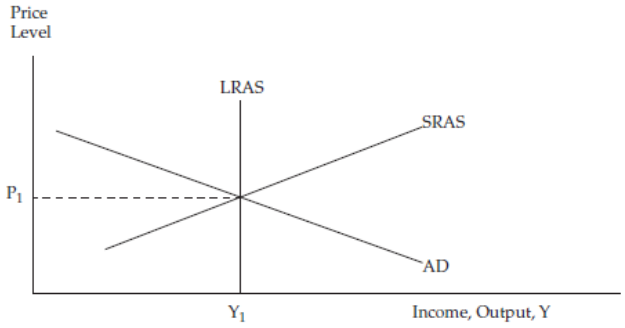

Figure 13. Long run macroeconomic equilibrium

Recessionary Gap

Cyclical short term fluctuations in real GDP and prices are caused by shifts in both the AD and SRAS curves. A shift to the left in AD results in lower GDP and lower prices. If such declines drive demand below economy's real potential GDP, the economy goes into recession. A **recession** is defined as a period during which GDP decreases (negative real GDP growth) for at least 2 successive quarters.
In recessionary gaps, equilibrium is below potential GDP.

Any factor which could cause the shift of AD curve to the left can sparkle a recessionary gap. Tightening of monetary policy, higher taxes, devaluation of equity and housing markets.

Investment implications of a decrease in AD

- Corporate profits will decline
- Commodity prices will decline
- Interest rates will decline
- Demand for credit will decline

As a result, analysts must reduce investment in **cyclical companies** because their business is most likely declining with the economical slowdown. Reduce investment in commodities, because commodity prices will decline as well as revenue growth. Increase investment in **defensive companies**. Increase investment in investment-grade and government issued fixed income securities (its price should increase as interest rates decline). Reduce investment in speculative equity securities and low credit quality ratings securities.

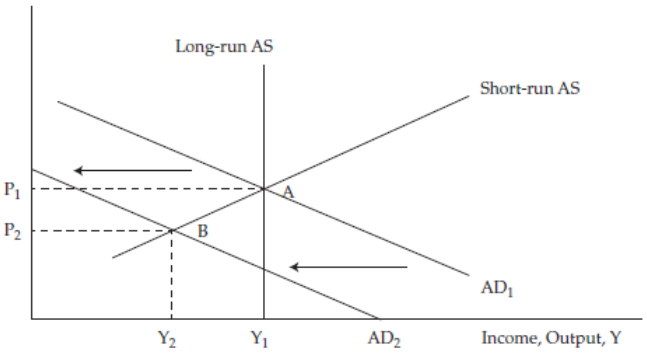

Figure 14. Recessionary Gap

Inflationary Gap

Increases in aggregate demand lead to unsustainable economic expansions. If the expansion drives the economy beyond its production potential and production capacity, the economy *overheats* and **inflation** occurs. This happens because the overall aggregate demand is higher than aggregate supply and due to economical constraints, aggregate supply cant expand in order to keep up with demand and price levels rise.
As a result of this additional demand, companies are forced to hire more workers and increasing wages and unemployment declines to unsustainable values - labor becomes scarce, increasing firm competition in labor markets. When an economy is operating at short run inflationary level, a inflationary gap occurs - GDP is above equilibrium, pushing up price levels.
As the economy can't keep up for long with over-utilization of its resources, it will increase price levels and economic growth in order to meet the LRAS.

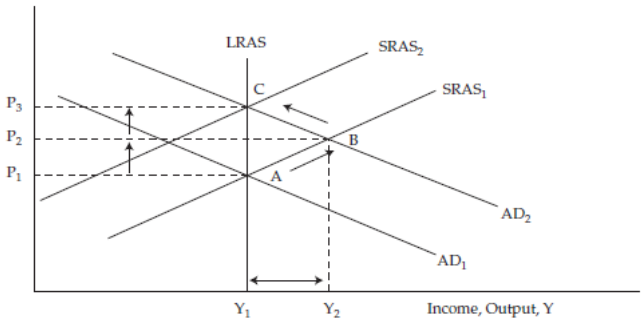

Figure 15. Inflationary Gap

Implications

- Corporate profits will rise
- Commodity prices will rise
- Interest rates will rise
- Inflationary pressures will build up

Investment strategy

- Increase investment in cyclical companies because they are expected to have the largest increase in earnings
- Reduce investment in defensive companies because they are expected to have only a modest increase in earnings
- Increase investments in commodities and commodity-oriented equities because they will benefit from higher production and output
- Reduce invesments in fixed-income securities, because they will decline as interest rates rise
- Raise exposure to speculative and higher yield fixed income securities (junk bonds) because default risks decline in economic expansions

Stagflation

Stagflation is a short-run macroeconomic state of high unemployment and increased inflation. When short run aggregate supply decreases (shift to the left), the economic aggregate output declines and price levels rise.
An example of stagflation was the oil crisis in the 1970s which made the input prices skyrocket and production and consumption levels plummet. As result, the unemployment and inflation rose.

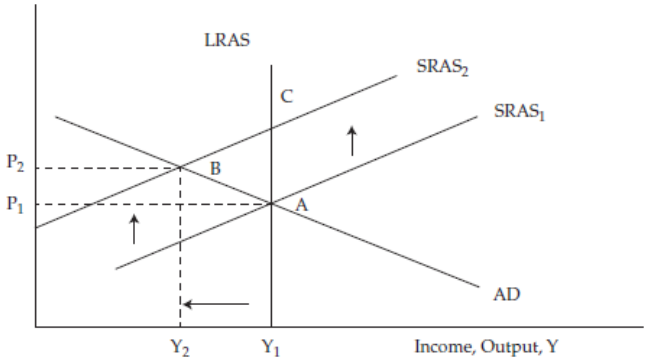

Figure 16. Stagflation

Implications

- Labor costs and raw materials surge
- Productivity declines
- Aggregate supply declines

Investment strategy

- Reduce investment in fixed income securities because the rising output prices (inflation) will put upward pressure in interest rates
- Reduce investment in equity securities because profit margins are squeezed
- Increasing investment in commodities or commodity based companies because prices are likely to rise

Summary

Change in AS	Change in AD	Effect on Real GDP	Effect on Aggregate Price Level
Increase	Increase	Increase	Indeterminate
Decrease	Decrease	Decrease	Indeterminate
Increase	Decrease	Indeterminate	Decrease
Decrease	Increase	Indeterminate	Increase

Figure 17. Effect of combined changes in AS and AD

3. Economic Growth and Sustainability

Economic growth is reflected as the annual percentual change in real GDP. The growth of GDP therefore measures how rapidly the total economy is expanding or shrinking, and per capita GDP is a measure of standard of living and reflects the ability of said population to afford goods and services.
In order to grow overtime, an economy needs to add new production capacity either through increased capital, labor or increased productivity. The sustainable rate of economic growth is therefore measured by the rate of increase in the economic potential GDP or productive capacity. If an economy grows more than its production capacity, it's said to be an unsustainable growth because it will lead to shortage of labor, inflation, environmental damage or lower consumption in favor of higher savings to finance the growth.

Potential GDP

The neoclassical or **Solow growth model** is the framework used to determine the underlying sources of growth in an economy. The model shows that the economy production capacity and potential GDP increase for two main reasons:

- accumulation of inputs, such as capital, labor and human capital, raw materials
- discovery, development and application of new technologies that increase the productivity of the production process (do more with less)

A 2 factor production function describing the quantitative link between levels of economical output and inputs and technology is given:

$$Y = AF(L,K) \tag{10}$$

where Y denotes the level of aggregate output (GDP), L is the quantity of labor or number of workers within an economy, K is the capital stock and A is technological knowledge or **total factor productivity** (TFP).
This model has two strong assumptions (1) production function is homogeneous of degree 0 (constant returns to scale), implying that if all inputs increase by the same percentage, the output will increase proportionally, (2) the function exhibits **diminishing marginal productivity** - at some point increasing individual inputs has marginal effects on production, without increasing other complementing inputs: if capital grows faster than labor, capital will become less productive and vice versa.
The diminishing marginal productivity has two major implications in GDP:

- Long-term sustainable growth cannot rely only on capital deepening investment and increasing stock of capital in relation to labor
- Given the relative scarcity of capital stock in developing countries, capital has high productivity and thus the growth rates of developing countries should exceed those of developed countries. The implies a convergence of incomes between developed and developing countries overtime.

Breaking down economic growth into growth in technology (W_T), growth in labor (W_L) and growth in capital (W_C):

$$Growth potential GDP = W_T + W_L + W_C \tag{11}$$

Sources of Economic Growth

- Labor supply
- Human capital
- Physical capital
- Technology
- Natural resources

Labor Supply Growth in th number of people available to work (Workforce) is an important source of economic development and partially accounts for the growth performance in developing countries vs developed countries. The labor supply also depends on how long is the workweek and how many hours a week each people works in average. In developed countries there is a tendency for this number to decrease.

Human Capital The quality of he labor force is also important. The knowledge and skills that works acquire through education (and professional experience) increase productivity. Better educated, skilled and healthier people work better and harder.
Human capital increases through investment in education and on-the-job training. Education has a spillover effect or externality impact: it increases the productivity of all the persons around it.

Physical Capital Stock The physical capital stock is the accumulation of production assets such as buildings, machinery and equipment. Countries with higher share of physical capital and higher gross fixed capital formation as percentage of GDP have higher GDP growth as well.

Technology The most important factor in developed countries is technology. Technological advances compel discoveries that make it possible to produce more and higher quality goods with the same amounts of resources or inputs.

Natural resources Natural resources account for raw materials and essential inputs to growth and include everything from land, to oil, to water. Natural resources can either be (a) renewable resources and (b) non renewable resources.

References

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