

ECO 209Y

MACROECONOMIC THEORY AND POLICY

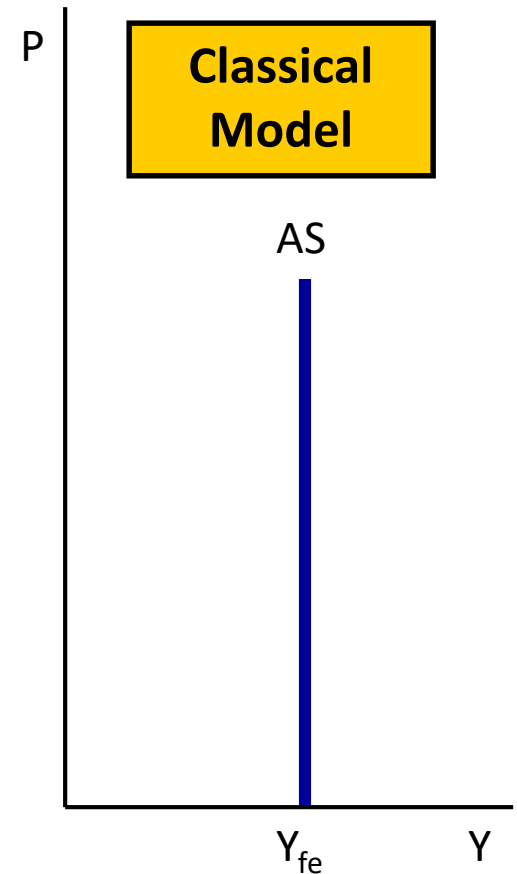
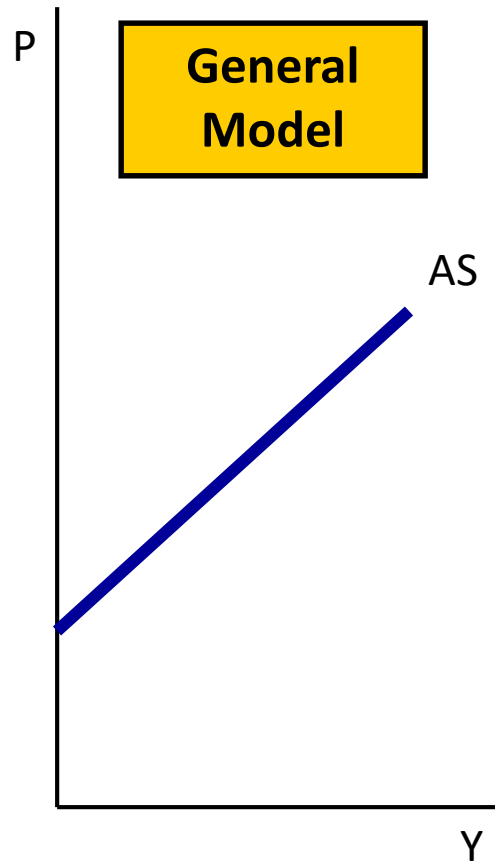
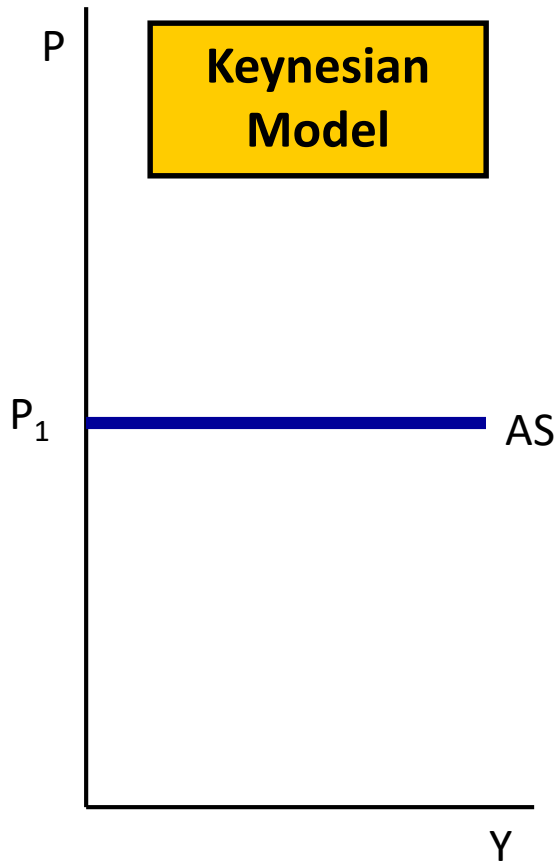
LECTURE 13:

THE AGGREGATE SUPPLY CURVE AND FISCAL POLICY

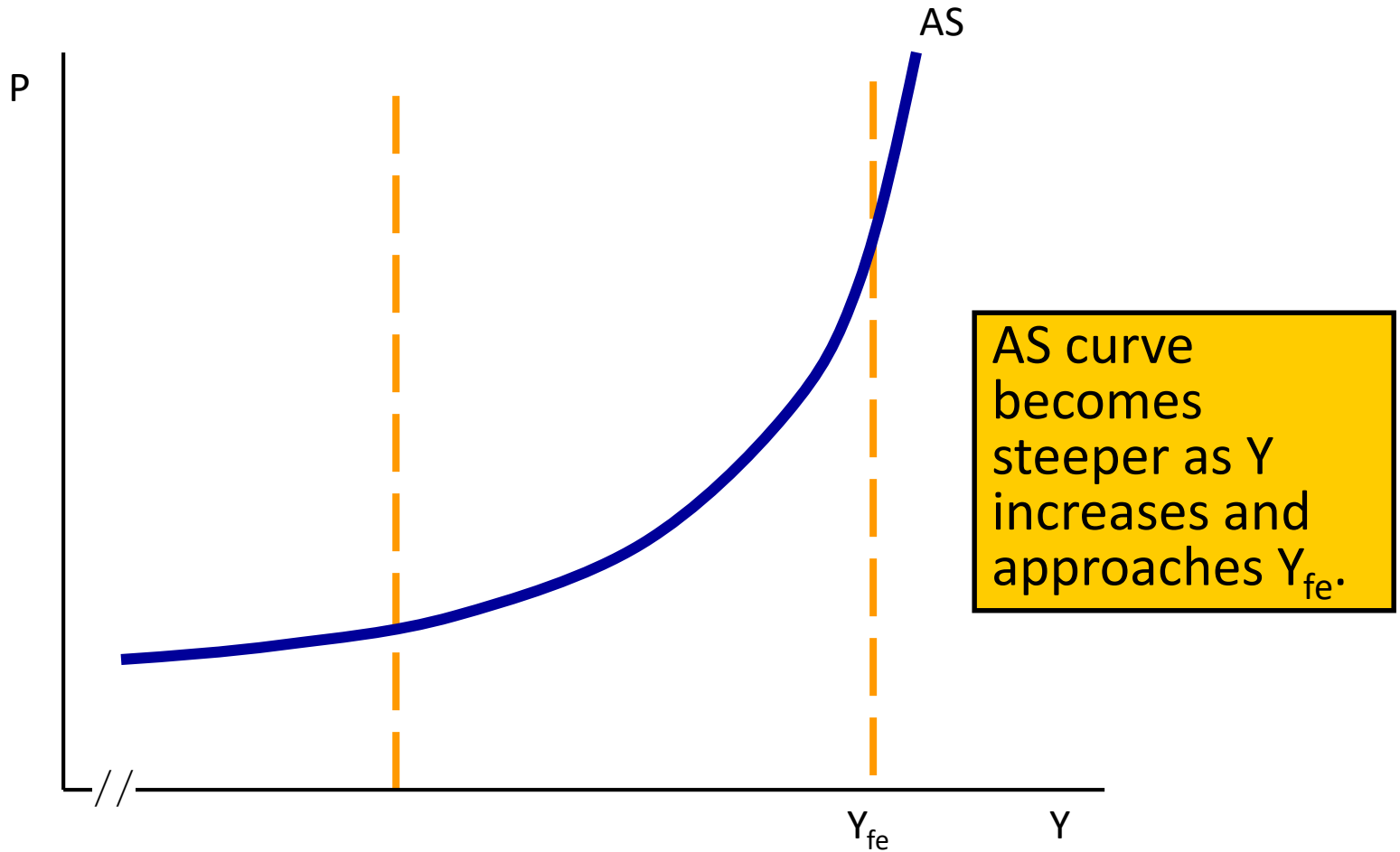
THE AGGREGATE SUPPLY CURVE

- The **aggregate supply (AS) curve** shows the relationship between the real value of output firms supply (**Y**) and the price level (**P**)
 - It shows how much output firms produce (supply) at each **P**
- Recall that any change in **nominal GDP** (**Y_N**) can be broken down into a change in **real GDP** (**Y**) and a change in **price level** (**P**)
 - $Y_N = P * Y \rightarrow \Delta Y_N = P \Delta Y + Y \Delta P$
- If there are many unemployed resources, an increase in **Y_N** will be the result mainly of an increase in **Y** since **ΔP** will be close to zero
 - At the extreme, the **AS** curve is horizontal at the fixed **P** → **Keynesian model**
- If the economy is close to full employment, **Y** cannot be increased much and any increase in **Y_N** will be mostly due to an increase in **P**
 - At the extreme, the **AS** curve is vertical at **Y_{fe}** → **Classical model**

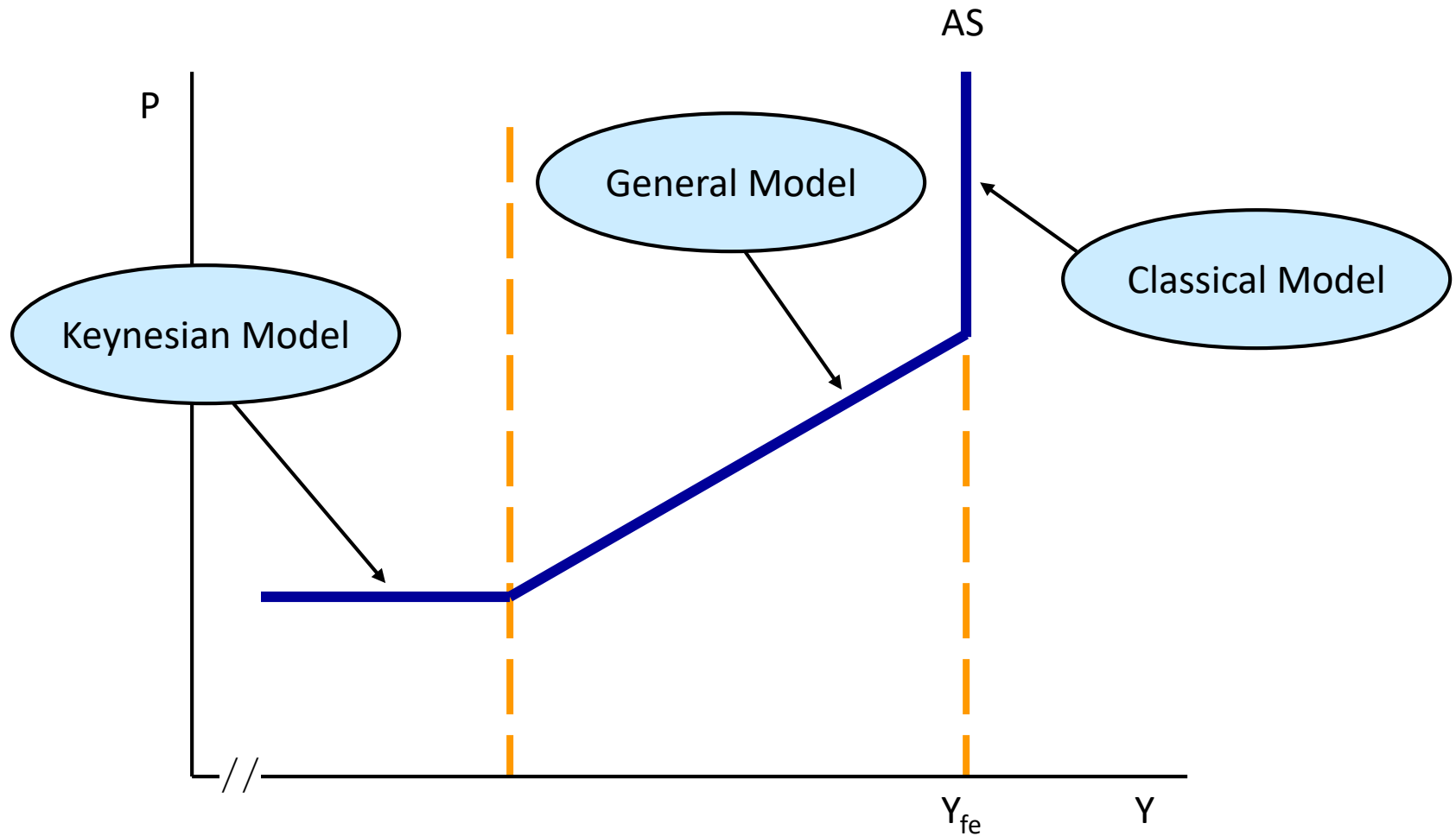
THE AS CURVE IN THE KEYNESIAN, GENERAL, AND CLASSICAL MODELS



THE AS CURVE



THE AS CURVE (CONT'D)



DERIVATION OF THE AS CURVE

- Following *neoclassical* theory, we will derive the *AS curve* by examining its microeconomic foundations
- In particular, we need to examine the behaviour of the markets underlying the *production process*: labour market, capital market, energy market, raw materials market, etc.
- We will focus on the *labour market*, but keeping in mind that there are also other important markets
- We'll begin with the analysis of the demand for labour, the supply of labour, the equilibrium in the labour market, and then we derive the *AS curve*

THE DEMAND FOR LABOUR

- Labour services are demanded by firms in order to produce goods and services
- Following *neoclassical* theory, the underlying *behavioural assumption* is that firms attempt to *maximize profits*
- Therefore, firms will hire the quantity of labour that allows them to maximize profits
- What is the firm's profit-maximizing quantity of labour?

THE PRODUCTION FUNCTION

- The production function indicates the maximum output that can be produced with any given combination of inputs
 - For instance, $Y = F(N, K, \theta)$, where Y is output, N is the quantity of labour, K is the capital stock, and θ represents the technology
 - For example, $F(N, K, \theta) = 5\theta N^{1/2} K^{1/2}$
- We will make two simplifying *assumptions*:
 - The time period is too short for the firm to adjust its capital stock (\bar{K})
 - The state of technology is also fixed ($\bar{\theta}$)

THE SHORT-RUN PRODUCTION FUNCTION

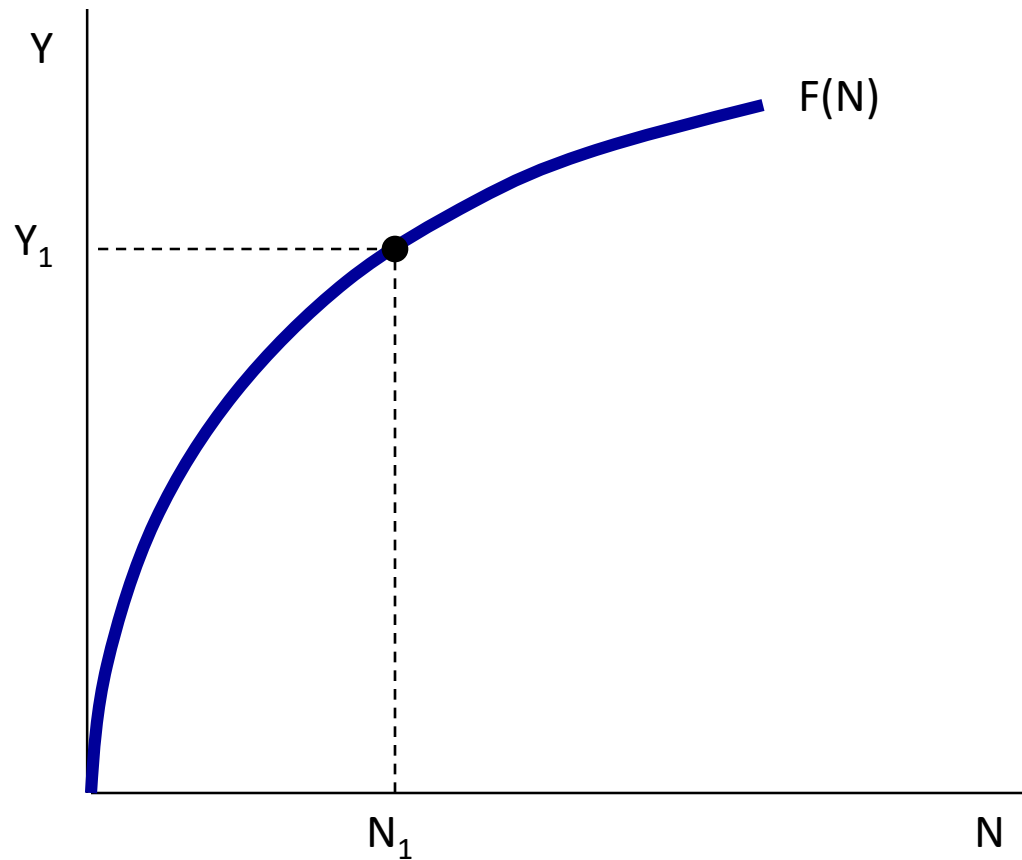
- In the short-run, the only variable factor of production is **labour** services and thus the short-run production function is $Y = G(N)$
 - Consider $F(N, K, \theta) = 5 \theta N^{\frac{1}{2}} K^{\frac{1}{2}}$
 - If $\theta = 1$ and $K = 9$, then $G(N) = 15N^{\frac{1}{2}}$
 - Hence, employing more labour is the **only** way to increase output in the short-run
- Note that the **long-run** is considered to be the situation where all factors of production are fully utilized in the process of production
 - Therefore, K and θ (and also the size of the working-age population) can only vary in the **very long-run**

THE SHORT-RUN PRODUCTION FUNCTION (CONT'D)

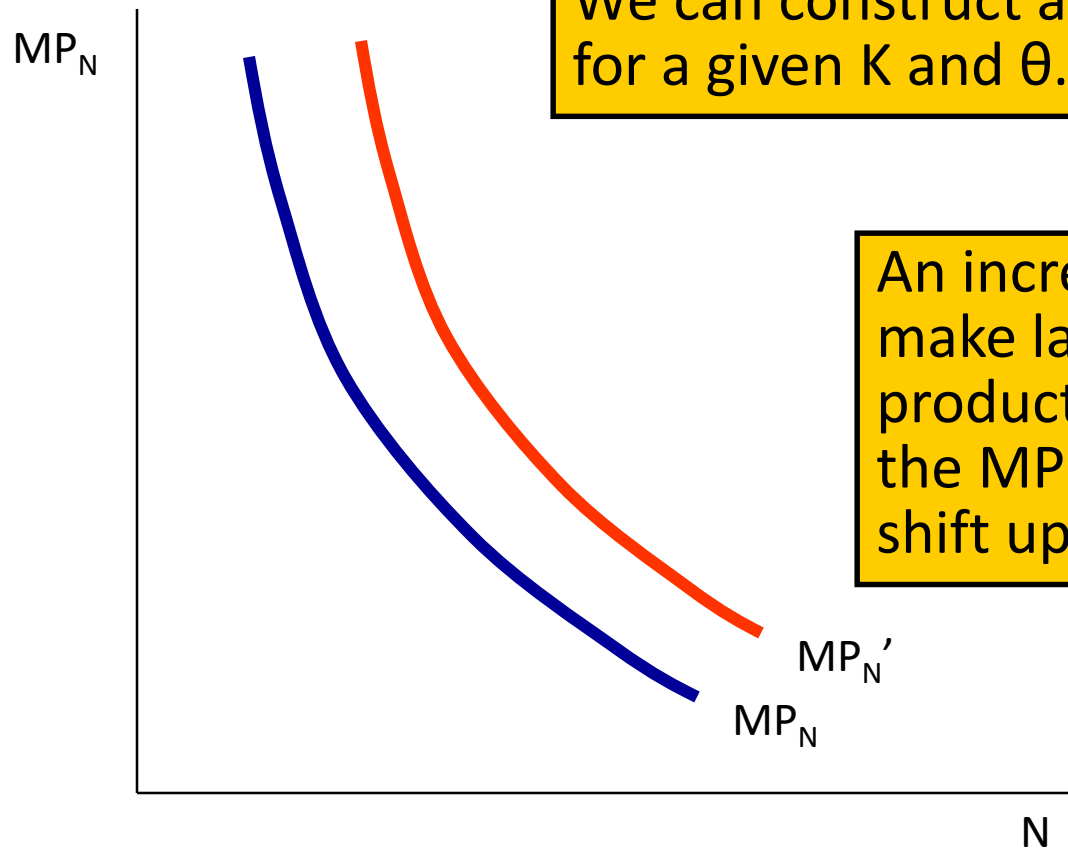
- We will further assume that the production function exhibits *diminishing returns to labour*
 - That is, if we increase the quantity of labour input, output will increase but at a decreasing rate
- *Diminishing returns to labour* is the same as saying that the marginal product of labour (MP_N) is a decreasing function of the quantity of labour
- Recall that the marginal product of labour is given by the *slope* of the short-run production function:

$$MP_N = \frac{\Delta Y}{\Delta N}$$

THE SHORT-RUN PRODUCTION CURVE



THE MARGINAL PRODUCT OF LABOUR



We can construct a MP_N curve for a given K and θ .

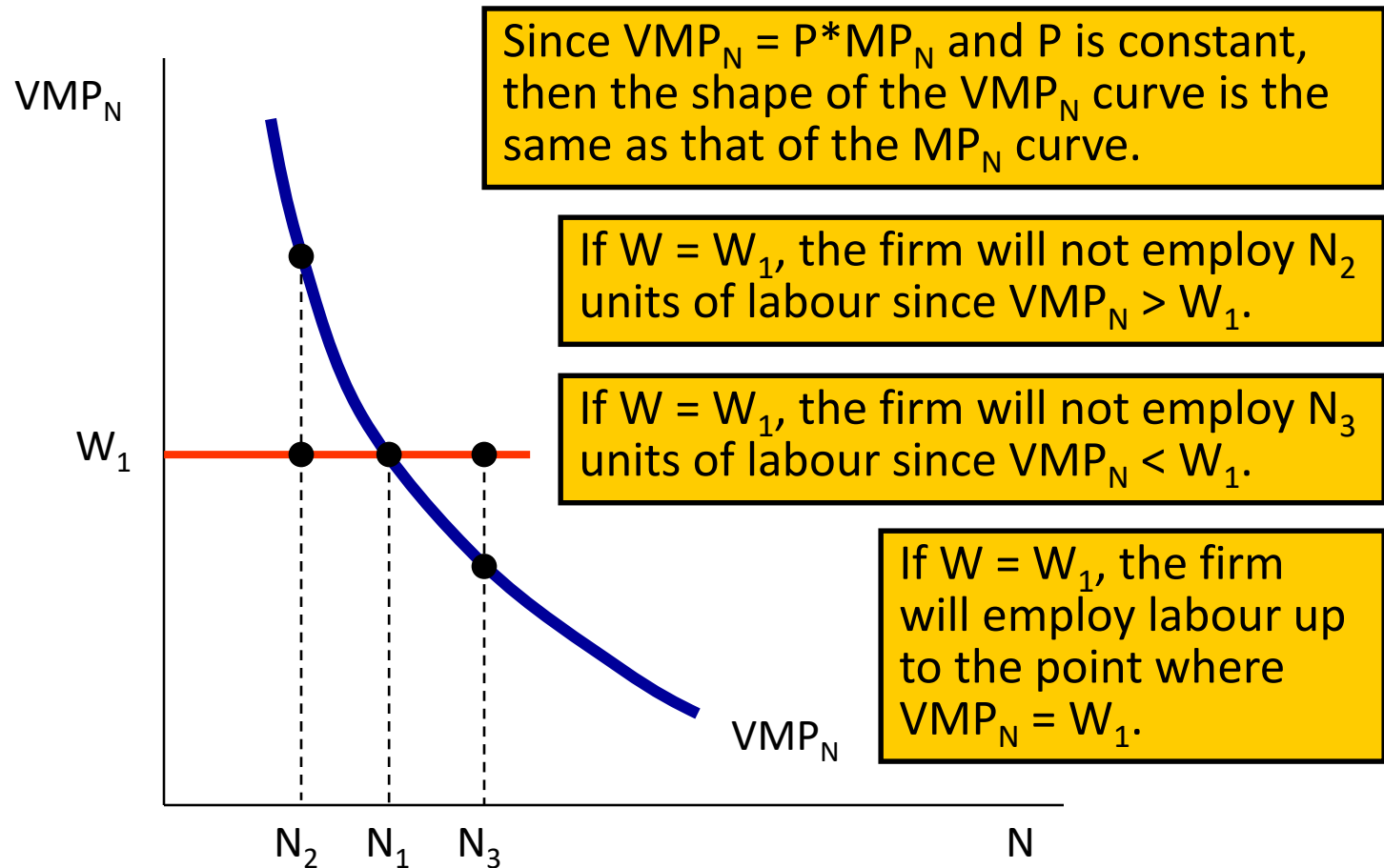
An increase in K will make labour more productive and thus the MP_N curve will shift up.

THE FIRM'S OPTIMUM QUANTITY OF LABOUR

- A profit-maximizing firm will hire labour up to the point where the additional revenue obtained by employing an additional unit of labour is exactly equal to the additional cost of employing that additional unit
 - The additional revenue obtained by employing an additional unit of labour is the **value** of the **marginal product of labour** ($VMP_N = P * MP_N$)
 - The additional cost of employing that additional unit of labour is the **nominal wage rate** (W)
- Therefore, the firm will employ labour up to the point where

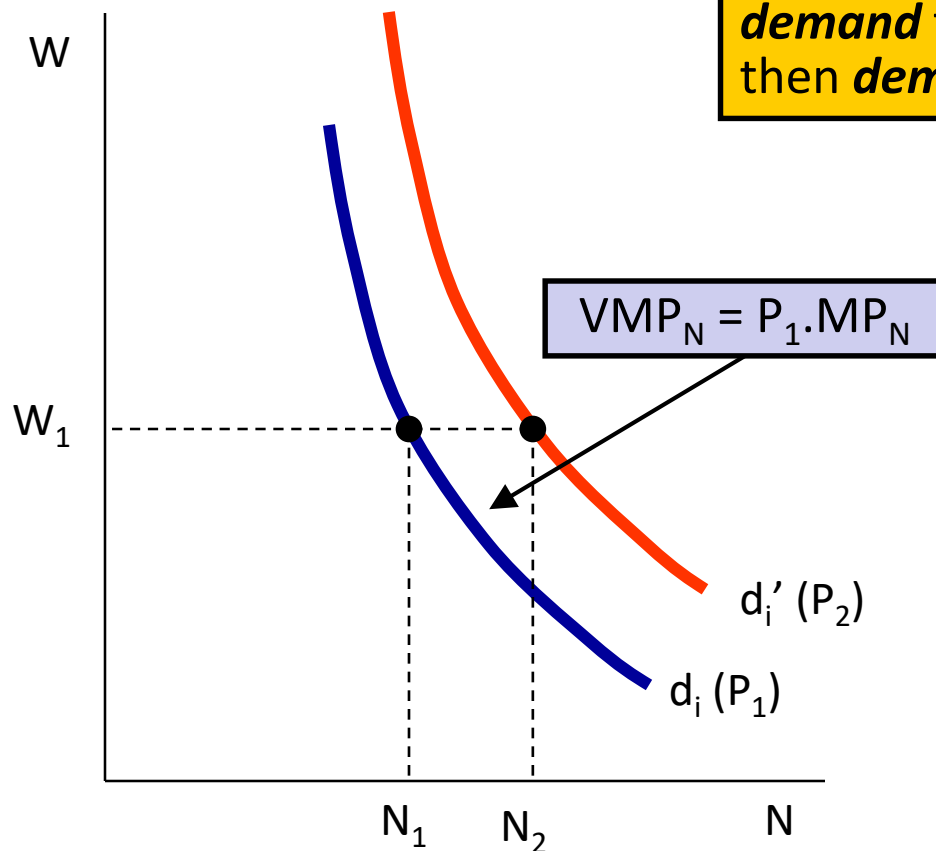
$$VMP_N = W$$

THE VALUE OF THE MARGINAL PRODUCT OF LABOUR



THE FIRM'S LABOUR DEMAND CURVE

Since the firm hires labour until $VMP_N = W$, then the VMP_N curve represents the firm's **demand** for labour curve. Since $VMP_N = P \cdot MP_N$, then **demand** for labour is a function of P .



Note that P_1 represents the price of firm i 's output.

If the price of firm i 's product increases to P_2 , then the firm's labour demand curve shifts up to $d'_i(P_2)$.

As P increases, the VMP_N rises at each level of N . Therefore, N increases until $VMP_N = W$ again.

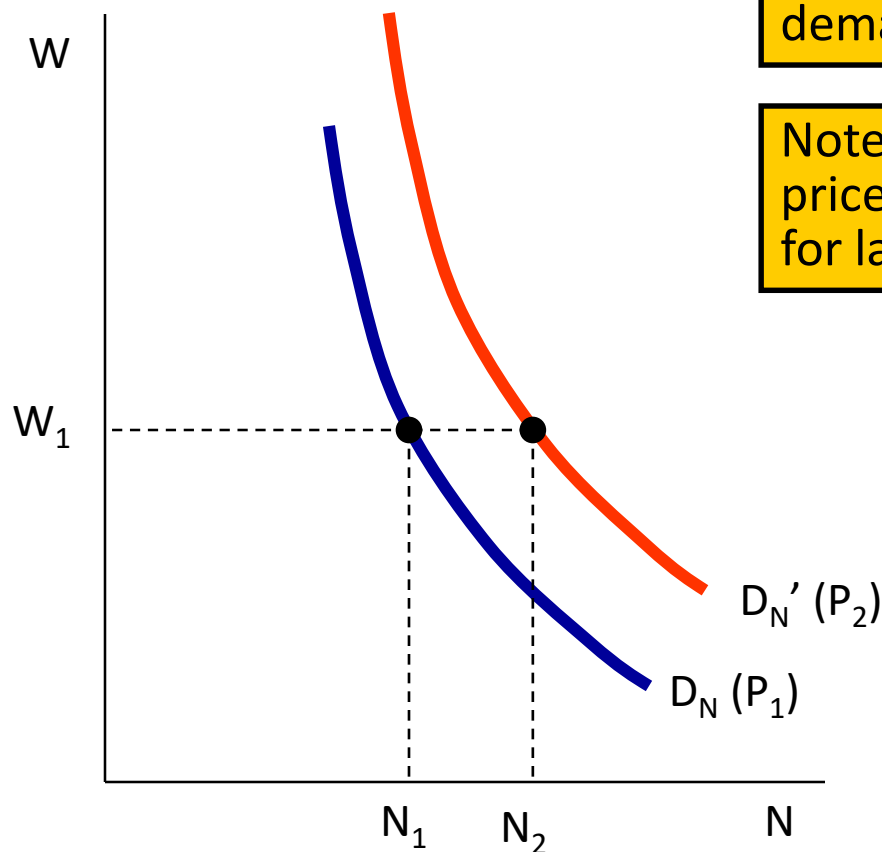
THE MARKET LABOUR DEMAND CURVE

The market demand curve is **assumed** to be the horizontal summation of each firm's demand curve.

Note that P_1 represents now the economy's price level. Therefore, the market **demand** for labour is a function of P .

If the price level increases to P_2 , then the market labour demand curve shifts up to $D_N'(P_2)$.

Again, as P increases, the VMP_N rises at each level of N for all firms. Therefore, N increases until $VMP_N = W$ for all firms.



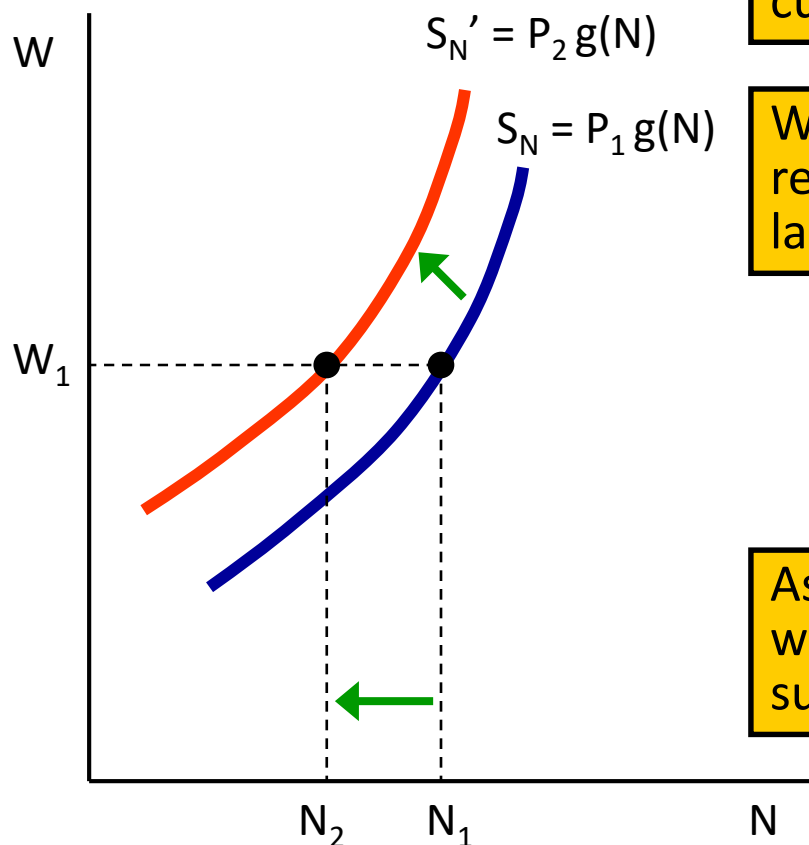
THE SUPPLY OF LABOUR

- We will consider four different models:
 - 1) **Classical Model** → labour supply as a function of **W/P**
 - 2) **General Model** → labour supply as a function of **W**
 - 3) **New Keynesian Model** → labour supply with rigid **W**
 - 4) **Old Keynesian Model** → labour supply with fixed **P** and fixed **W**
- The ***demand for labour*** will be assumed to be the same in each of these models → always a function of **W/P**
- We will derive the ***supply of labour*** in each of these models, and examine the corresponding labour market equilibrium
 - We will then derive the **aggregate supply (AS)** curve corresponding to each of these models

LABOUR SUPPLY IN THE CLASSICAL MODEL

- In the classical model both labour *demand* and labour *supply* depend on **P**, i.e., firms and workers know **W/P**:
 - Labour Demand: $W = D_N(P)$
 - Labour Supply: $W = P g(N)$where $g(N)$ is such that $\Delta g / \Delta N > 0$
- Equating the *demand* for labour and the *supply* of labour, we solve for equilibrium **N**
- Note that the positions of both the *demand* for labour and the *supply* of labour are affected when **P** changes
 - It is *assumed* that both firms and workers are aware of any changes in **P** (and thus in **W/P**)

THE CLASSICAL LABOUR SUPPLY CURVE



When the price level is P_1 , the market supply curve is $S_N = P_1 g(N)$.

When the nominal wage is W_1 (and thus the real wage is W_1/P_1), the quantity supplied of labour is N_1 .

If the price level increases to P_2 , then the market labour supply curve shifts up to $S_N' = P_2 g(N)$.

As the price level increases to P_2 , the real wage decreases to W_1/P_2 and the quantity supplied of labour decreases to N_2 .

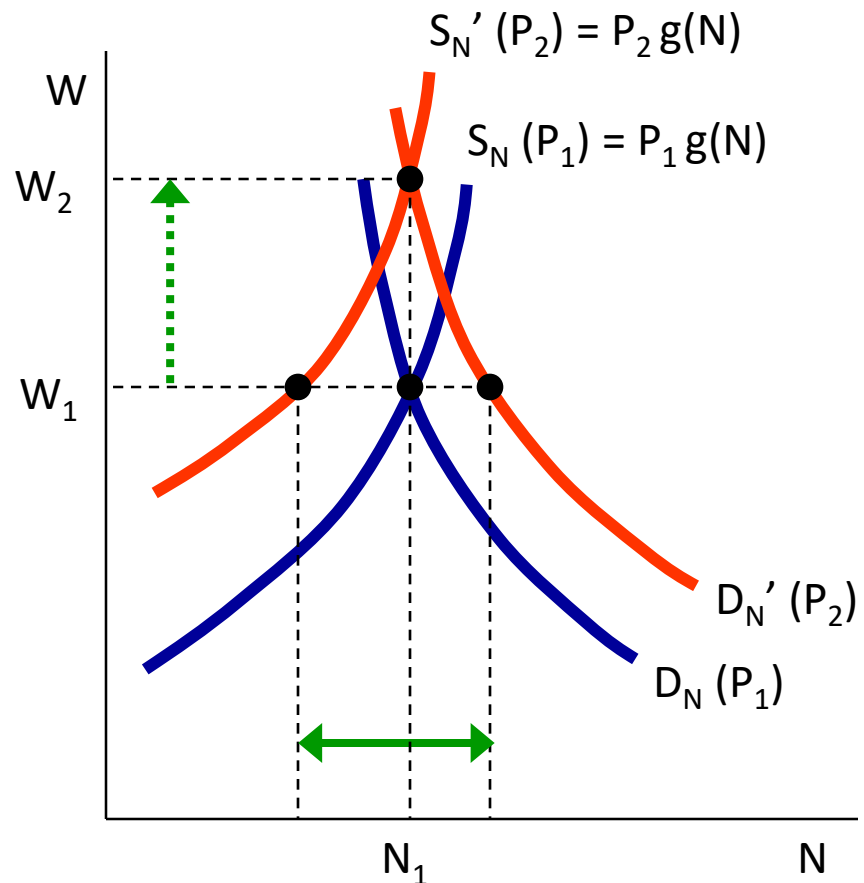
CLASSICAL MODEL: LABOUR MARKET EQUILIBRIUM

When the price level is P_1 , the demand for labour is $D_N(P_1)$ and the supply of labour is $S_N(P_1) = P_1 g(N)$.

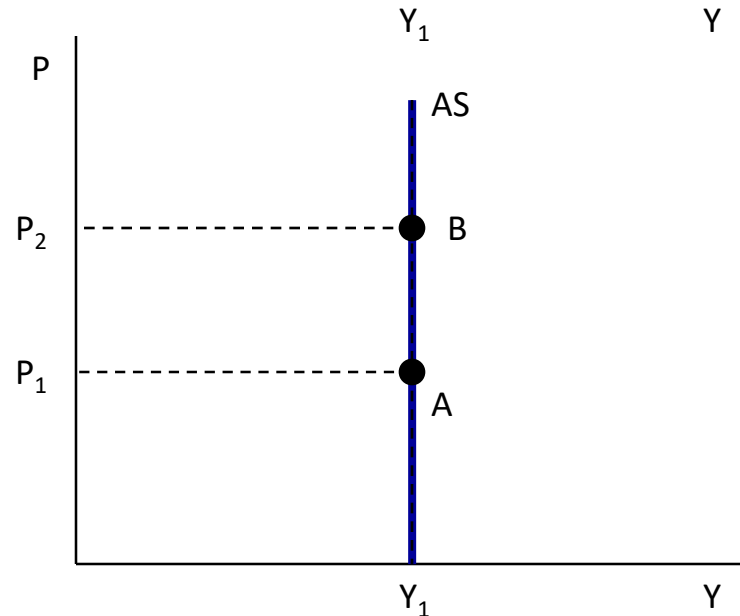
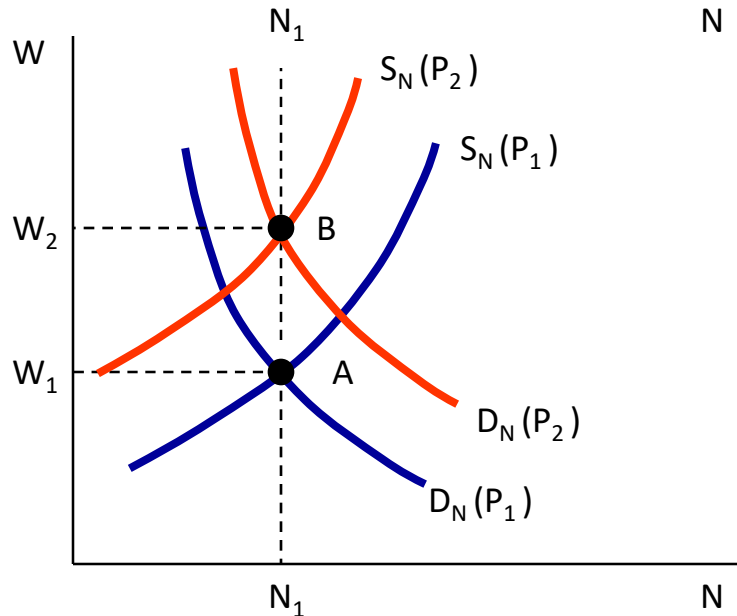
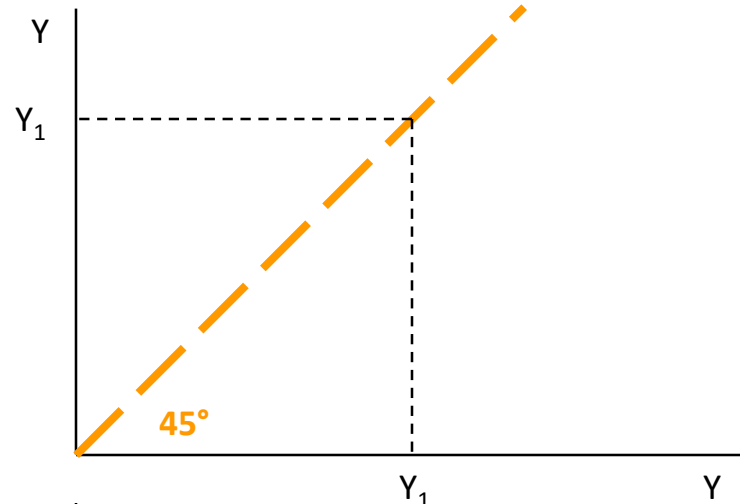
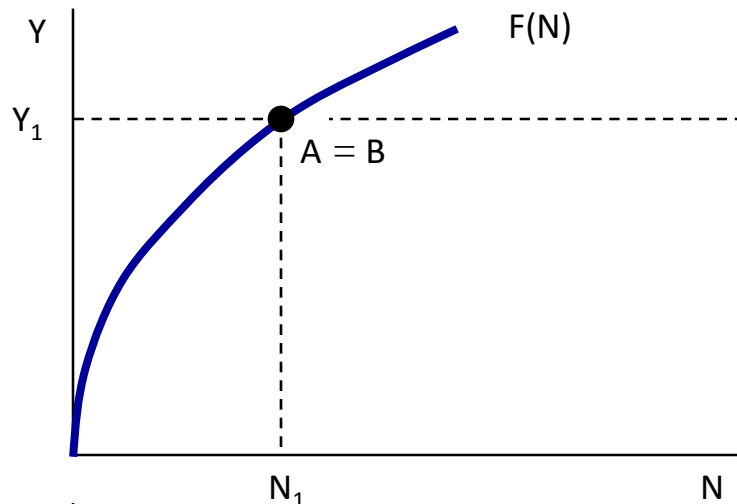
If $P = P_1$, the equilibrium nominal wage is W_1 (and thus the real wage is W_1/P_1) and the equilibrium level of employment is N_1 .

If P increases to P_2 , labour demand and supply curves shift to $D_N'(P_2)$ and $S_N'(P_2) = P_2 g(N)$, respectively.

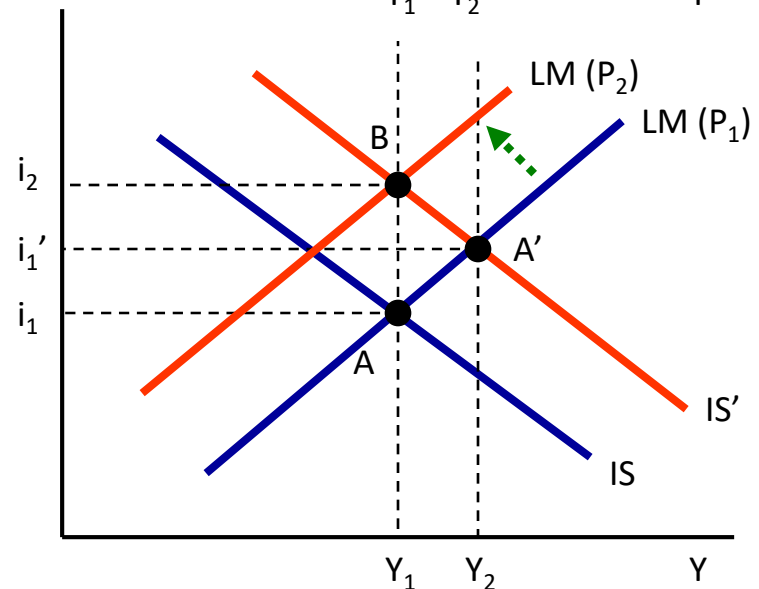
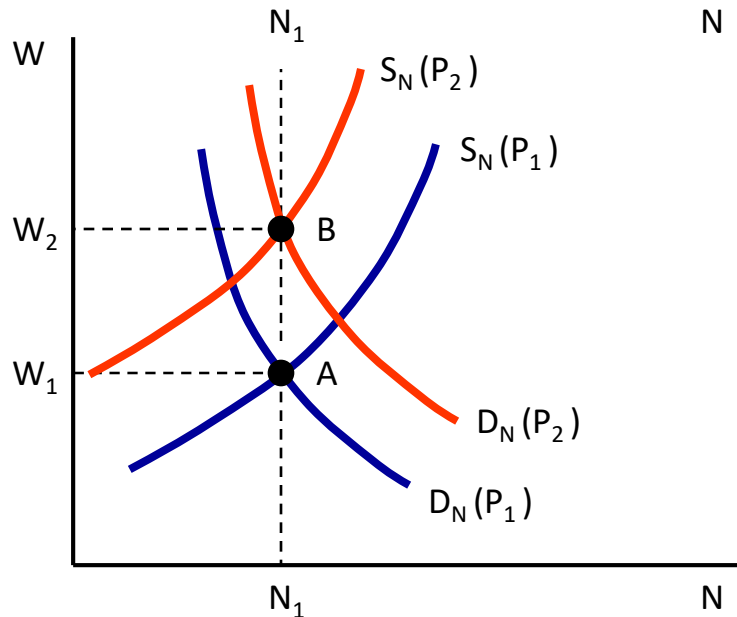
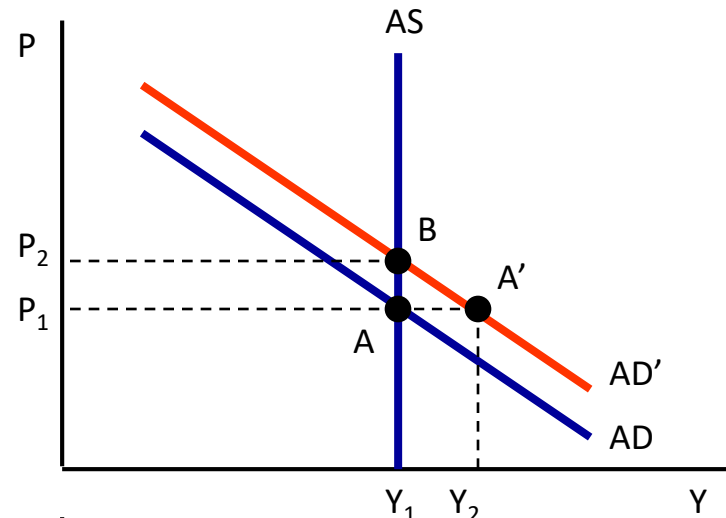
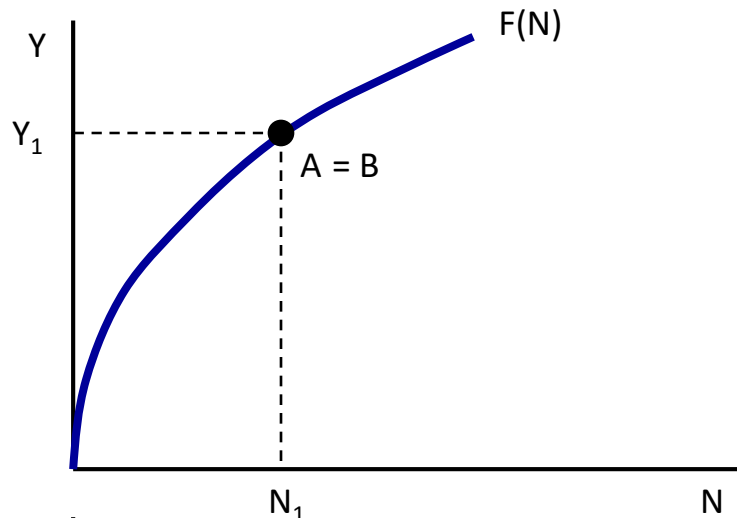
Therefore, the nominal wage increases to W_2 to eliminate the excess demand while the level of employment remains at N_1 .



THE AGGREGATE SUPPLY CURVE



EXPANSIONARY FISCAL POLICY: CLASSICAL MODEL



THE ADJUSTMENT PROCESS

■ *On the Supply Side:*

- As **P** increases, both the **S_N** and the **D_N** shift up in the same proportion
- Therefore, there is no change in **N** and thus no change in **Y**
- This is a movement up along the **AS** curve

■ *On the Demand Side:*

- As **P** increases, the real money supply decreases and thus the **LM** curve starts shifting to the left
- As the interest rate rises, investment (**I**) falls and thus quantity demanded begins to decrease
- This represents a movement up the **AD'** curve
- In this case, there is a ***complete crowding-out effect***

CLASSICAL MODEL: IMPACT OF EXPANSIONARY FISCAL POLICY

- The net result of the expansionary fiscal policy is as follows:

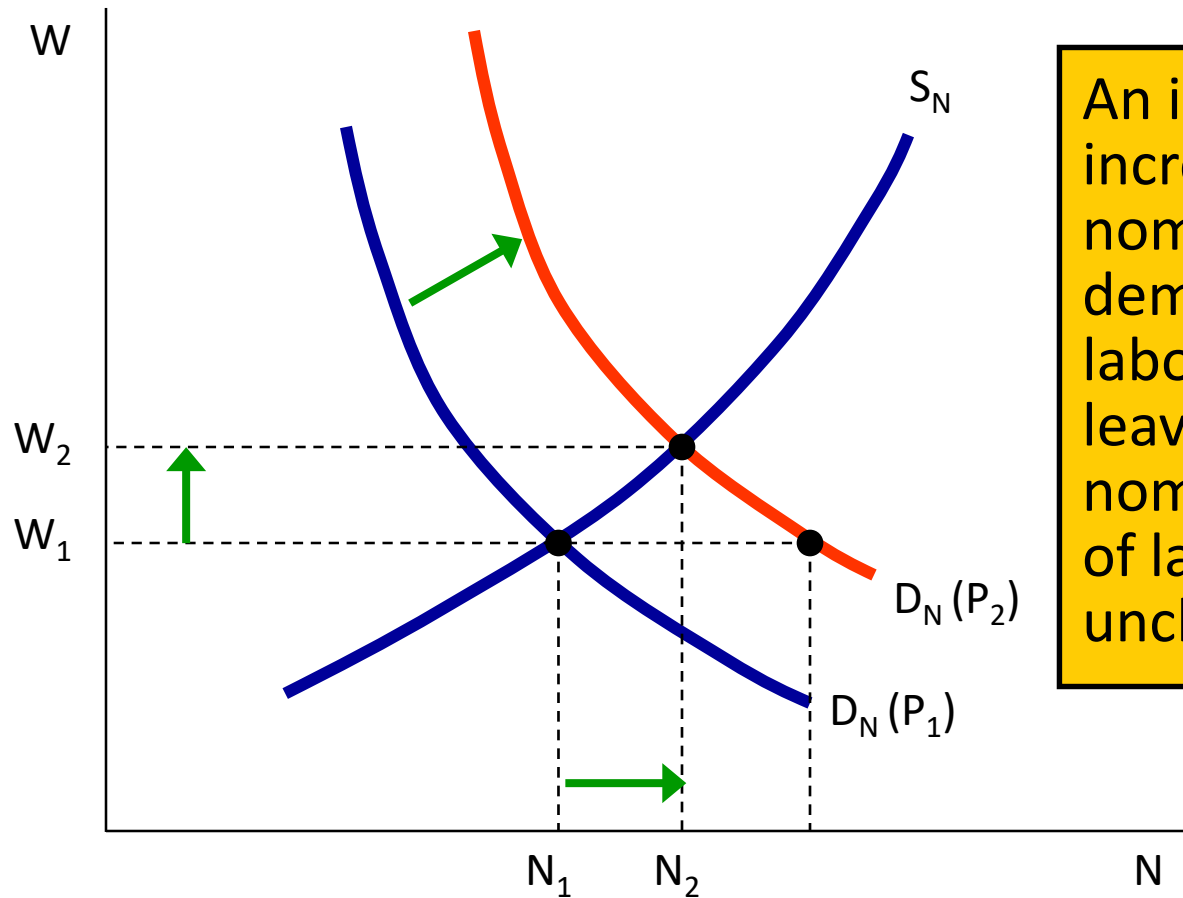
- $\Delta Y = 0$
- $\Delta N = 0$
- $\Delta W > 0$
- $\Delta P > 0$
- $\Delta(W/P) = 0$
- $\Delta i > 0$
- $\Delta I < 0$

There is a complete crowding-out effect: G increases and I decreases by the same absolute amount.

LABOUR SUPPLY IN THE GENERAL MODEL

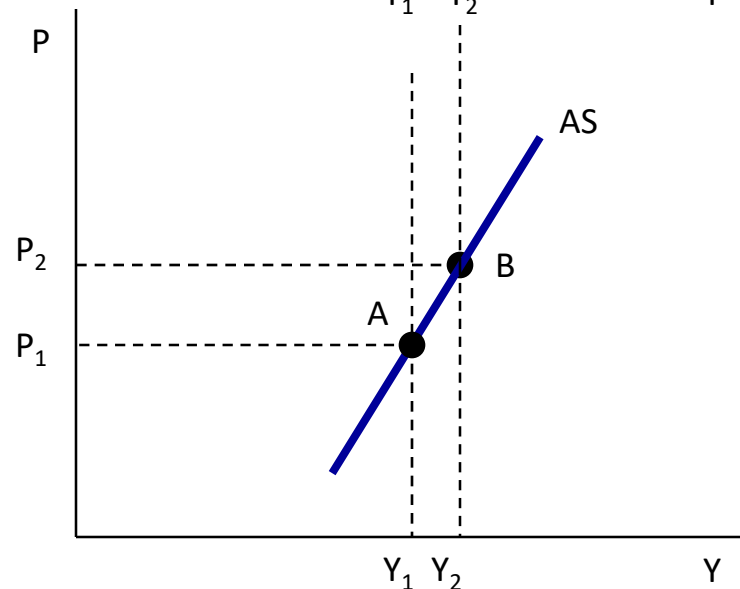
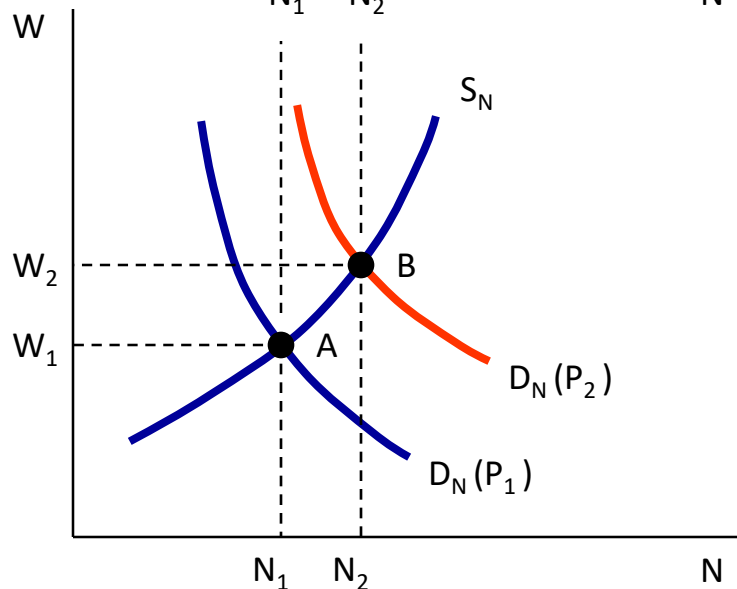
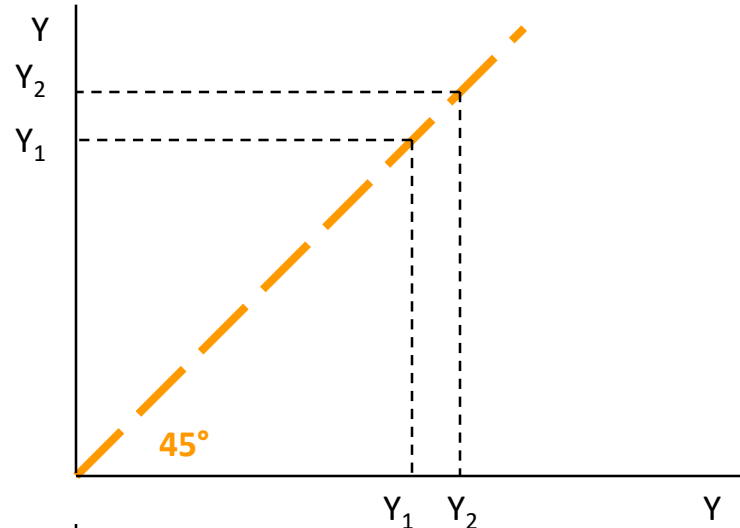
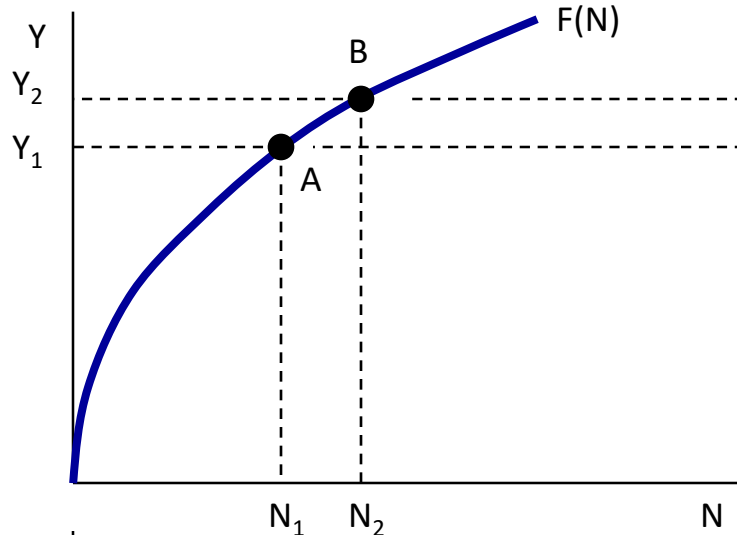
- In this model workers do not take into account price movements when determining how much labour to supply
 - That is, they interpret a change in the nominal wage rate as a change in the real wage rate
 - In this case we say that workers suffer from *money illusion*
 - Therefore, labour supply depends *only* on the nominal wage rate
- The system of equations corresponding to this model is:
 - **Labour Demand:** $W = D_N(P)$
 - **Labour Supply:** $W = g(N)$
- Equating the *demand* for labour and the *supply* of labour, we solve for equilibrium **N**

GENERAL MODEL: LABOUR MARKET EQUILIBRIUM

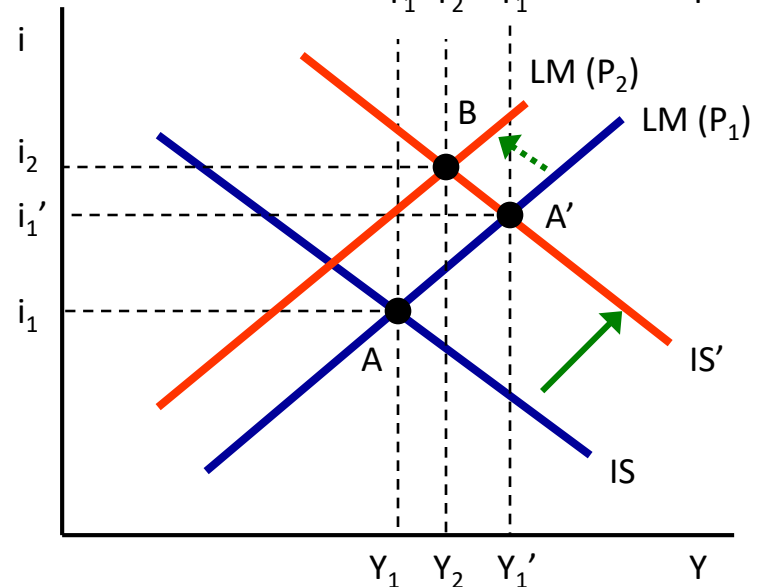
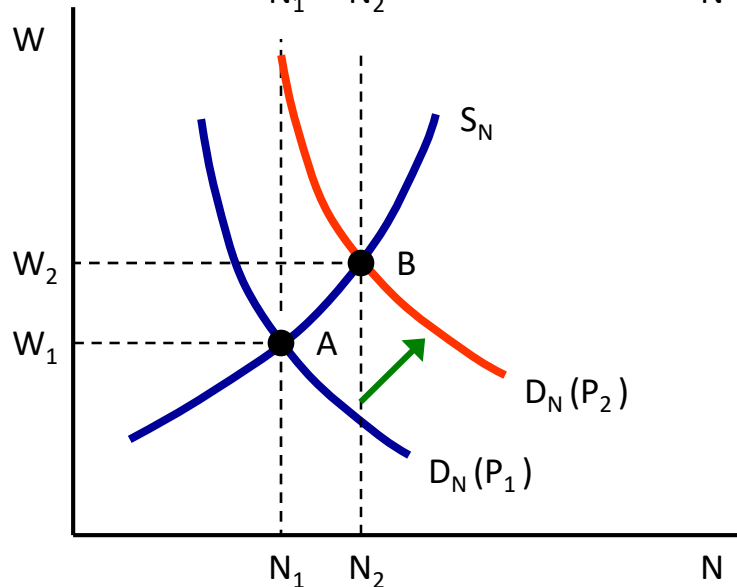
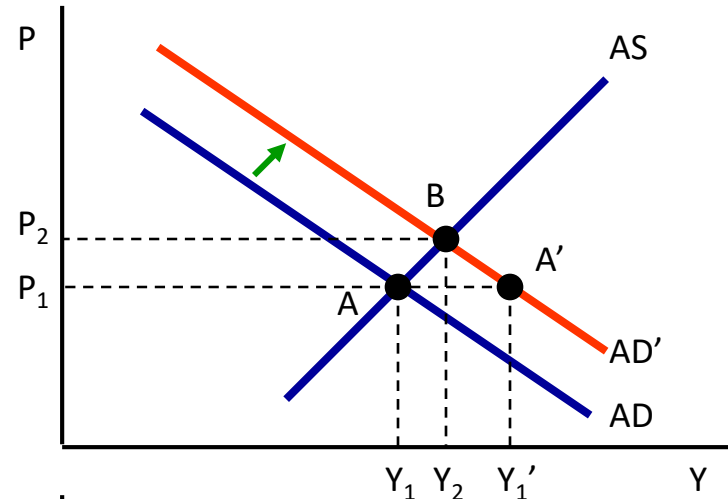
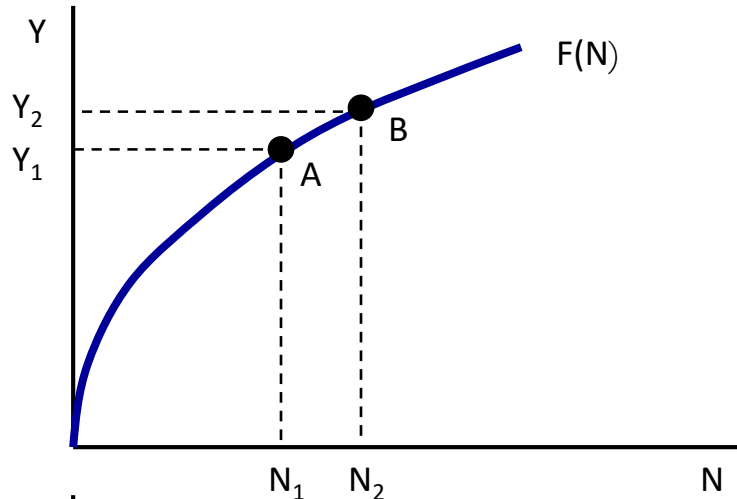


An increase in P increases the nominal demand for labour but leaves the nominal supply of labour unchanged.

THE AGGREGATE SUPPLY CURVE



EXPANSIONARY FISCAL POLICY: GENERAL MODEL



THE ADJUSTMENT PROCESS

■ *On the Supply Side:*

- As P increases, the D_N curve shifts up while the S_N curves remains unchanged
- As D_N increases, N increases and so does Y
- This is a movement up along the AS curve

■ *On the Demand Side:*

- As P increases, the real money supply decreases and thus the LM curve starts shifting to the left
- As the interest rate rises, investment (I) falls and thus quantity demanded begins to decrease
- This represents a movement up the AD' curve
- In this case, there is a *partial crowding-out effect*

GENERAL MODEL: IMPACT OF EXPANSIONARY FISCAL POLICY

- The net result of the expansionary fiscal policy is as follows:

- $\Delta Y > 0$
- $\Delta N > 0$
- $\Delta W > 0$
- $\Delta P > 0$
- $\Delta(W/P) < 0$
- $\Delta i > 0$
- $\Delta I < 0$

There is a partial crowding-out effect: G increases and I decreases, but the decrease in I is smaller than the increase in G .

INVOLUNTARY UNEMPLOYMENT

- Note that both the Classical Model and the General Model do not allow for the possibility of *involuntary* unemployment
 - That is, both models depict equilibrium in the labour market where $N_D = N_S$
 - Here we have that, at the equilibrium wage rate, everyone who wants a job can find it
 - Hence, any unemployment that may exist is *voluntary* unemployment
- Next we will consider a model which explains the emergence of *involuntary* unemployment
- But let's first examine the different views about *unemployment*

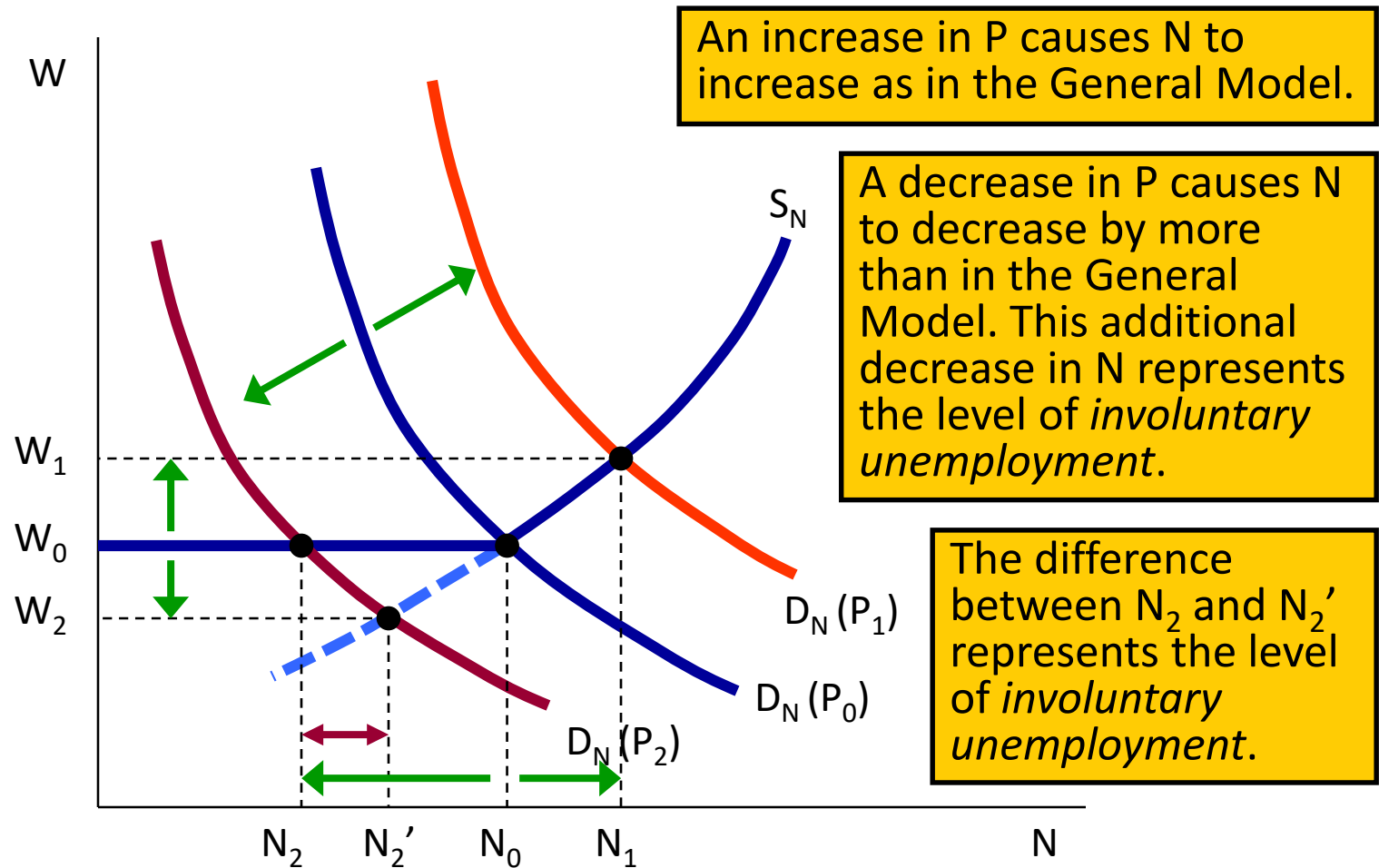
ALTERNATIVE VIEWS OF UNEMPLOYMENT

- The *neoclassical* view is that unemployment is *voluntary* and is essentially a *supply-side* phenomenon
 - People prefer not to work
- The *Keynesian* view is that unemployment is *involuntary* and mainly a *demand-driven* phenomenon
 - It is essentially caused by an insufficient **AD**
- The *new-Keynesian* view is that unemployment is *involuntary* and both a *demand-side* and a *supply-side* phenomenon
 - Due to labour market *rigidities* (e.g., minimum wage)
- The “*sociological*” view considers unemployment to be a societal problem and not strictly an economic one
 - Society decides what is *acceptable* unemployment

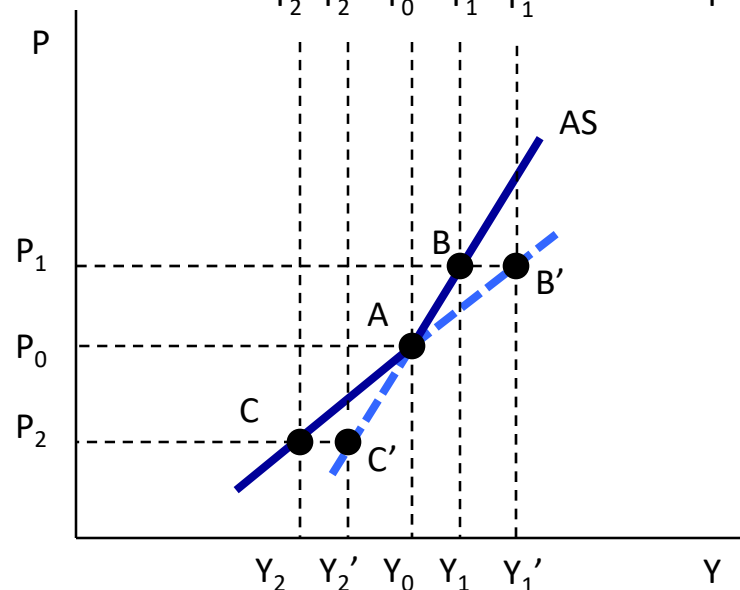
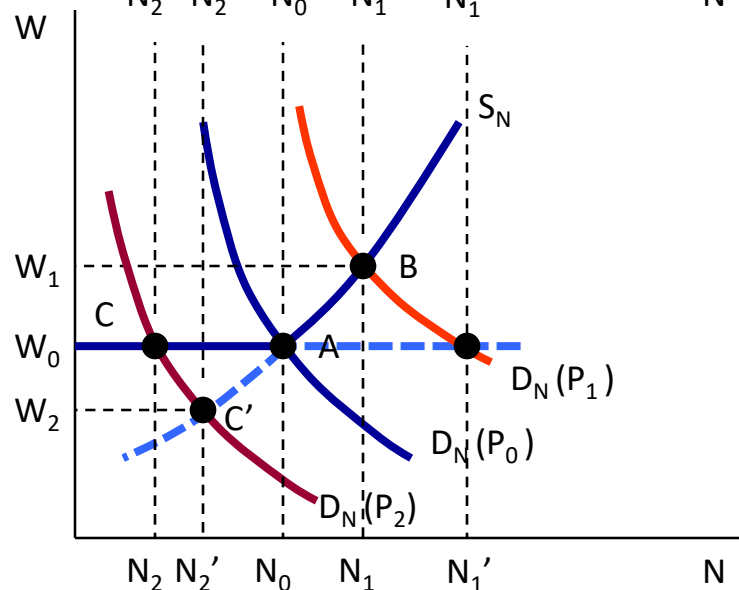
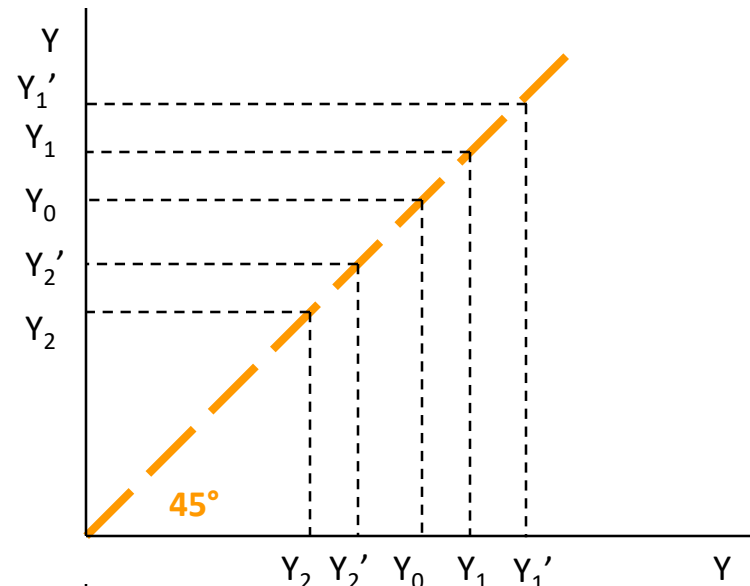
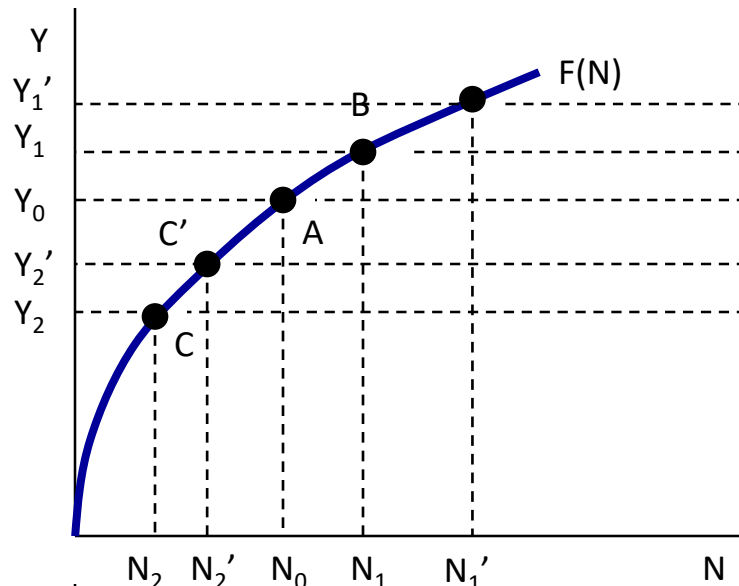
LABOUR SUPPLY IN THE NEW KEYNESIAN MODEL

- Keynes suggested that nominal wages are not perfectly flexible, that they tend to be “sticky” downwards
- To simplify matters, suppose that nominal wages are sticky *downwards* at the initial equilibrium level W_0
 - Note that we could also *assume* that wages are sticky both *downwards* and *upwards*
- We can characterize the labour market as follows:
 - **Labour Demand:** $W = W = D_N(P)$
 - **Labour Supply:** $W = g(N)$ if $N > N_0$
 $W = W_0$ if $N \leq N_0$
- Equating the *demand* for labour and the *supply* of labour, we solve for equilibrium N

NEW KEYNESIAN MODEL: LABOUR MARKET EQUILIBRIUM

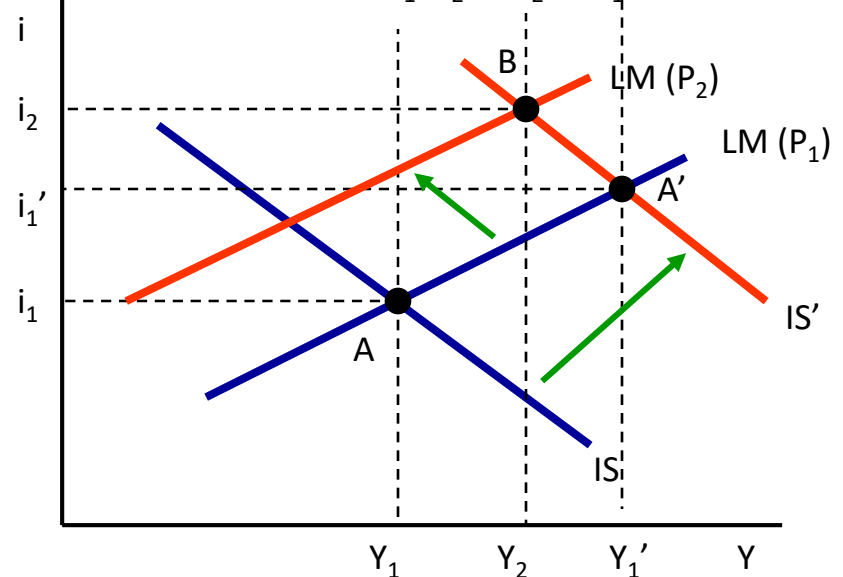
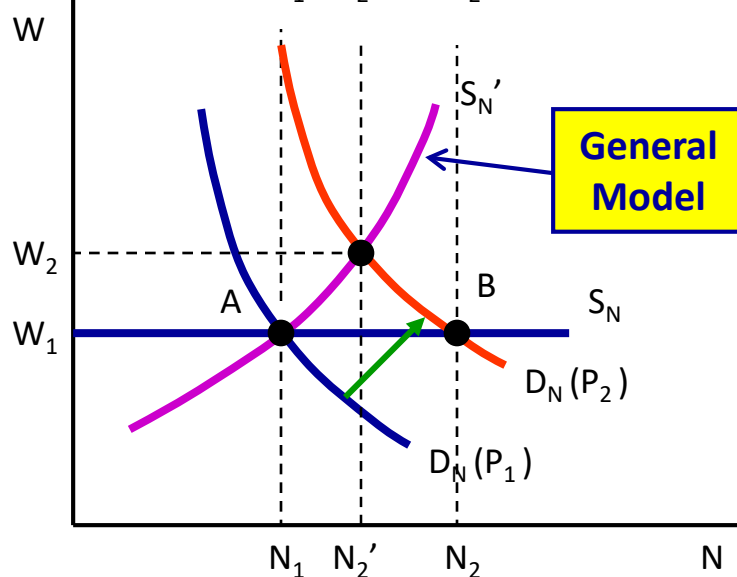
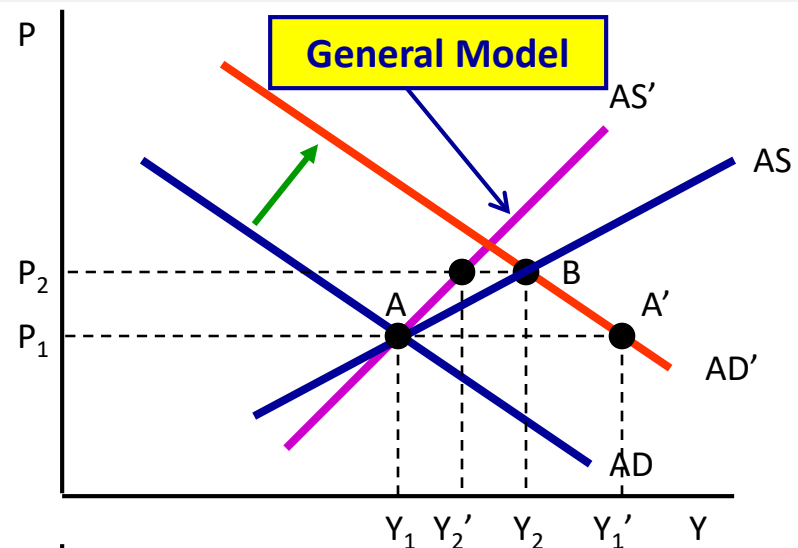
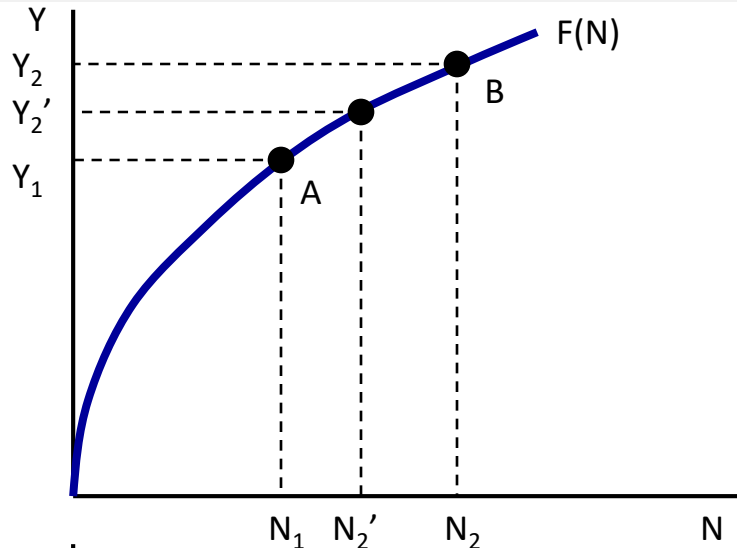


THE AGGREGATE SUPPLY CURVE



Money wages are assumed sticky both **downwards** and **upwards**.

EXPANSIONARY FISCAL POLICY: NEW KEYNESIAN MODEL



THE ADJUSTMENT PROCESS

■ *On the Supply Side:*

- As P increases, the D_N curve shifts up while the S_N curves remains unchanged
- As D^N increases, N increases and so does Y
- This is a movement up along the AS curve

■ *On the Demand Side:*

- As P increases, the real money supply decreases and thus the LM curve starts shifting to the left
- As the interest rate rises, investment (I) falls and thus quantity demanded begins to decrease
- This represents a movement up the AD' curve
- In this case, there is a *partial crowding-out effect*

NEW KEYNESIAN MODEL: IMPACT OF EXPANSIONARY FISCAL POLICY

- The net result of the expansionary fiscal policy is as follows:

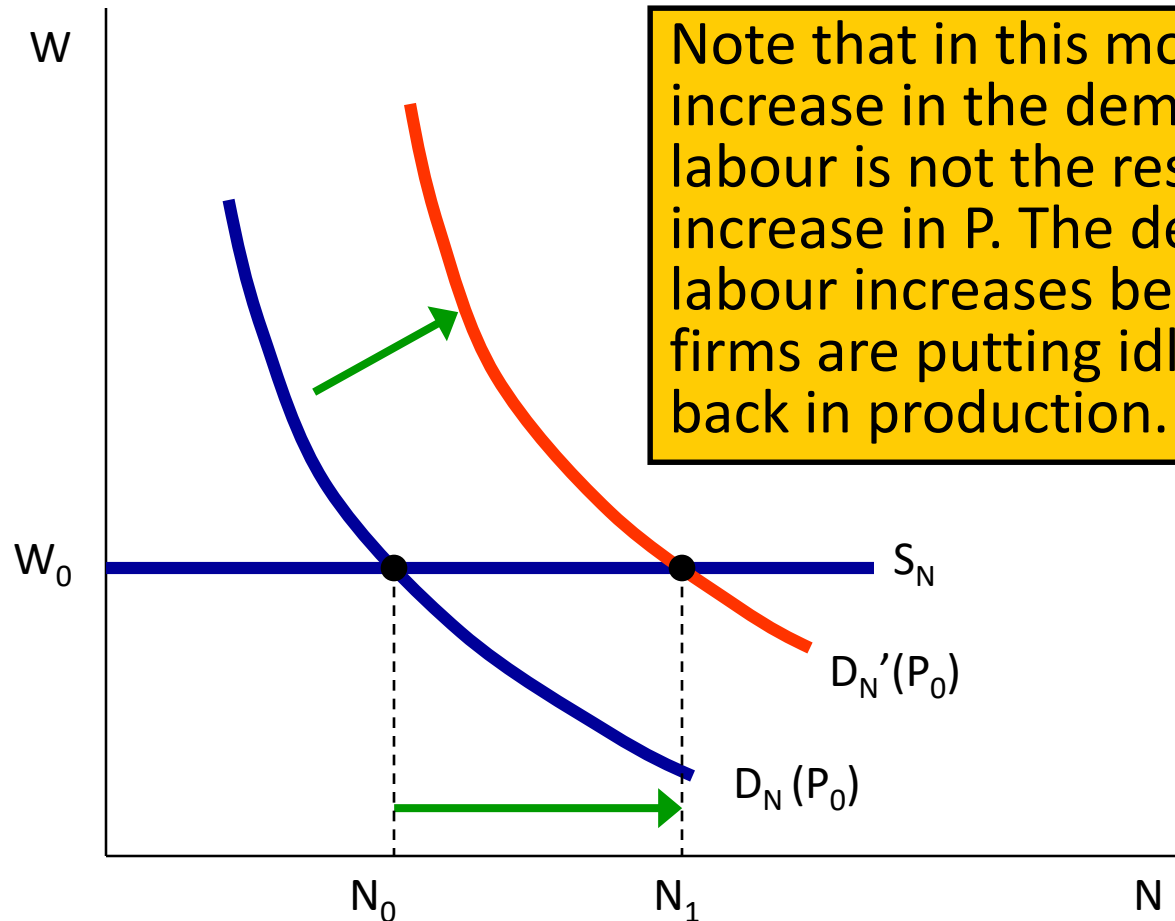
- $\Delta Y > 0$
- $\Delta N > 0$
- $\Delta W = 0$
- $\Delta P > 0$
- $\Delta(W/P) < 0$
- $\Delta i > 0$
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There is a partial crowding-out effect: G increases and I decreases, but the decrease in I is smaller than the increase in G .

LABOUR SUPPLY IN THE OLD KEYNESIAN MODEL

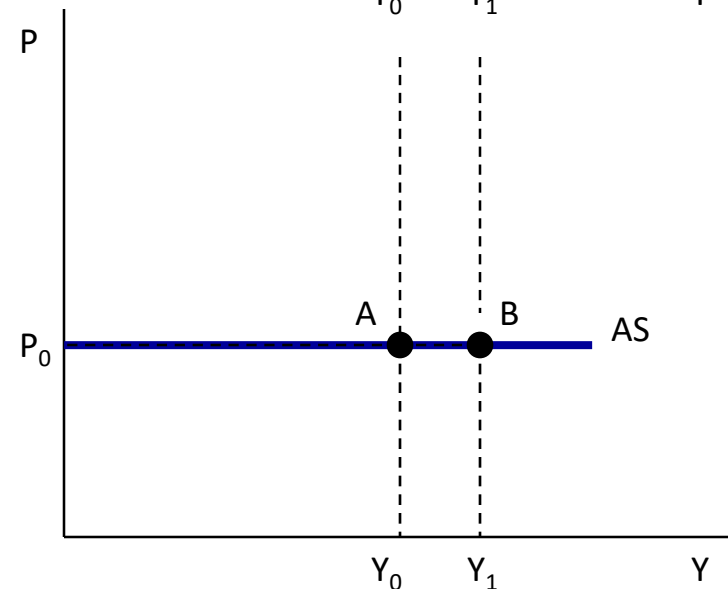
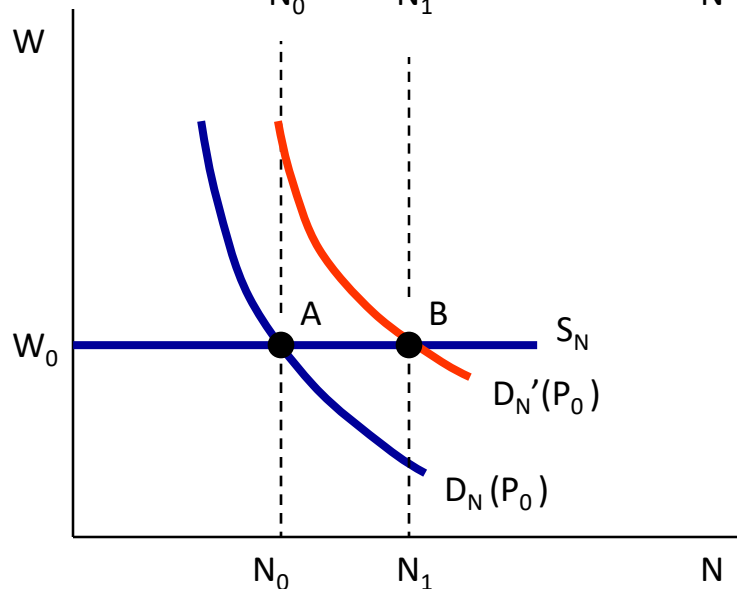
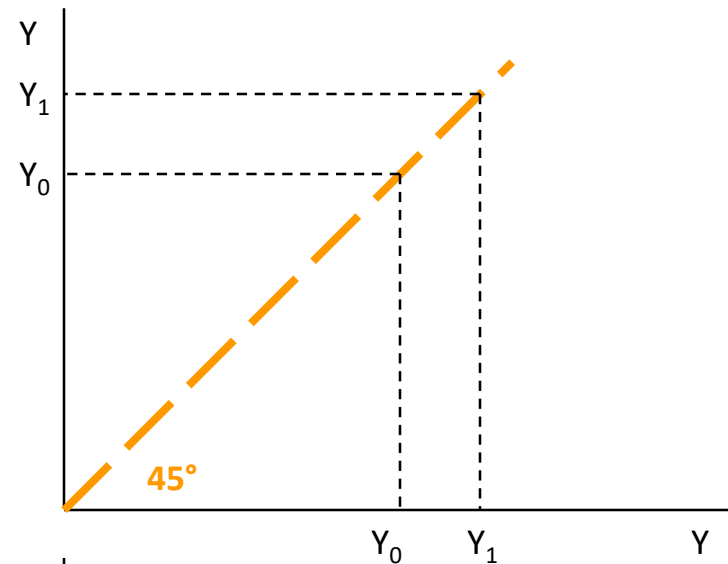
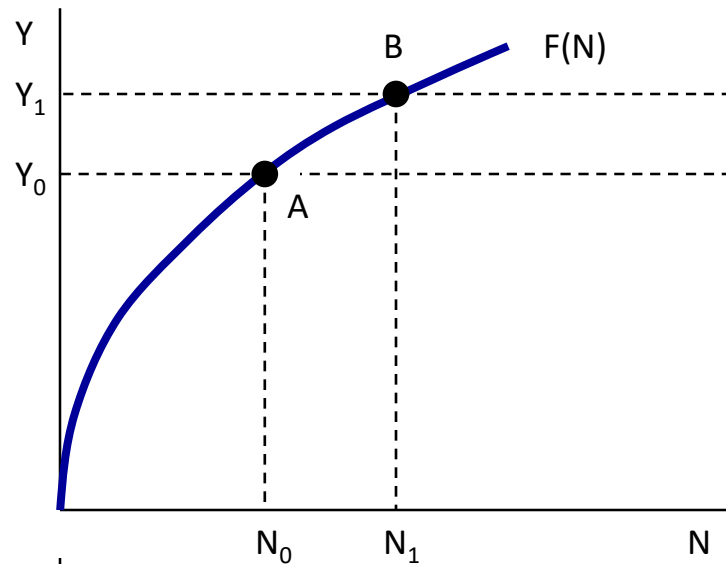
- In the Old Keynesian model both the nominal wage and the price level are assumed fixed
 - Firms are able to hire as much labour as they wish at the fixed nominal wage
 - Firms are willing to supply as much as it is demanded at the fixed price level
- The following is the system of equations describing labour market equilibrium in this model:
 - **Labour Demand:** $W = D_N (P_0)$
 - **Labour Supply:** $W = W_0$
- Equating the *demand* for labour and the *supply* of labour, we solve for equilibrium **N**

OLD KEYNESIAN MODEL: LABOUR MARKET EQUILIBRIUM



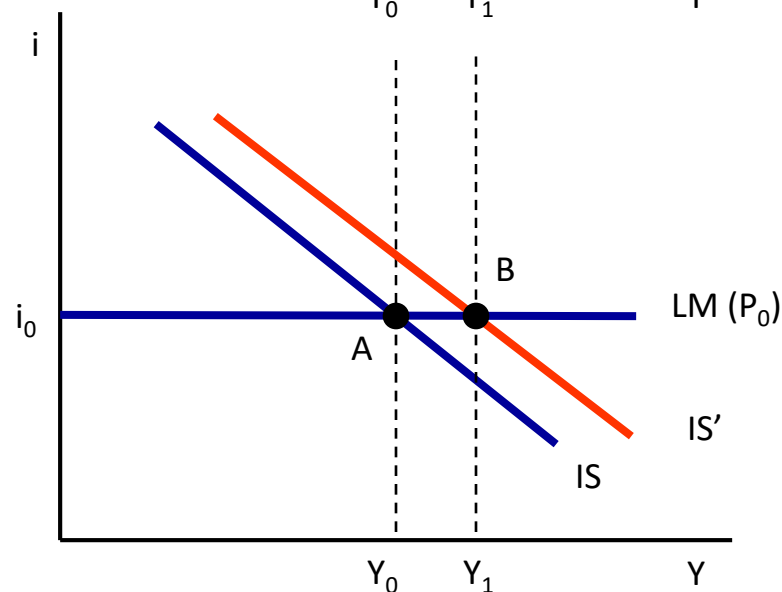
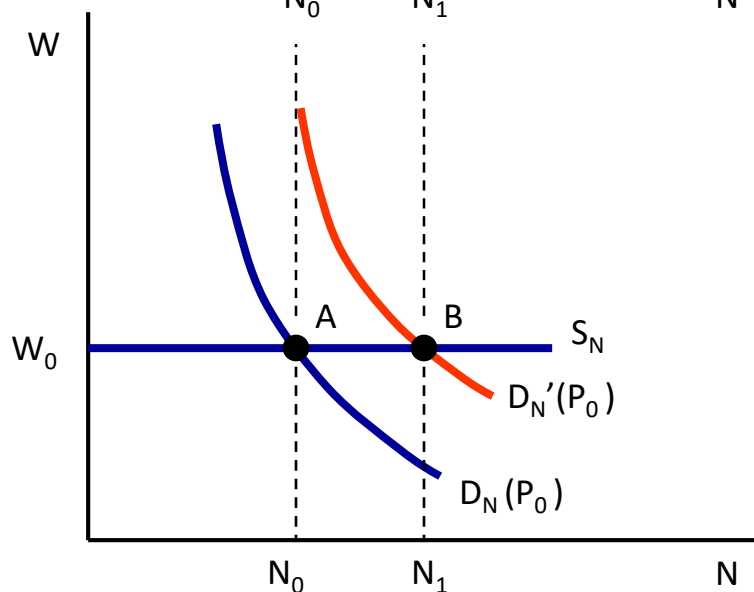
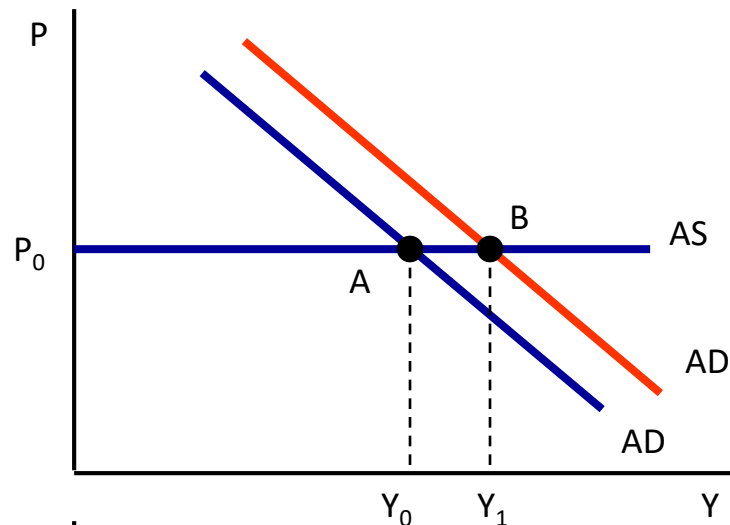
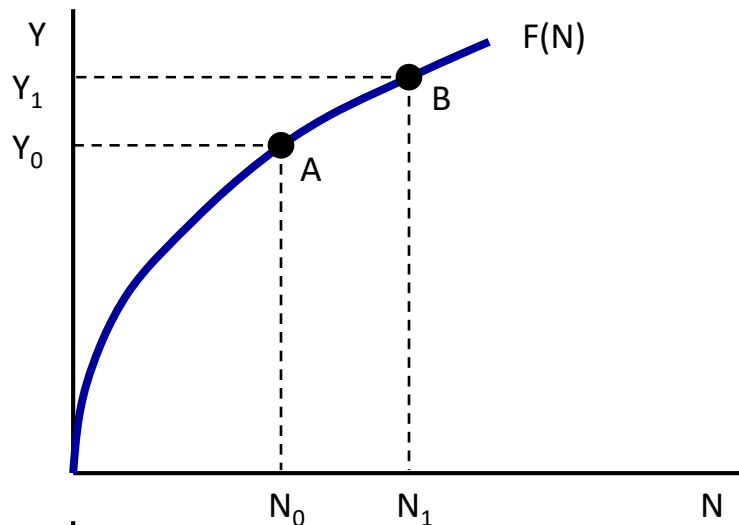
Note that in this model the increase in the demand for labour is not the result of an increase in P . The demand for labour increases because some firms are putting idle capital back in production.

THE AGGREGATE SUPPLY CURVE



In a deep recession, the economy might be facing a **liquidity trap** (i.e., flat LM curve).

EXPANSIONARY FISCAL POLICY: OLD KEYNESIAN MODEL



THE ADJUSTMENT PROCESS

■ *On the Supply Side:*

- To satisfy the larger demand, more capital is brought back into production and the demand for labour increases
- The equilibrium level of **N** increases and so thus **Y**
- This is a movement along the **AS** curve

■ *On the Demand Side:*

- There is a liquidity trap, and thus economic agents are willing to hold any amount of money at the interest rate i_0
- The interest rate does not rise as **Y** increases, and thus investment (**I**) is not affected
- In this case, there is ***no crowding-out effect***

OLD KEYNESIAN MODEL: IMPACT OF EXPANSIONARY FISCAL POLICY

- The net result of the expansionary fiscal policy is as follows:

- $\Delta Y > 0$
- $\Delta N > 0$
- $\Delta W = 0$
- $\Delta P = 0$
- $\Delta(W/P) = 0$
- $\Delta i = 0$
- $\Delta I = 0$

There is no crowding-out effect:
G increases and I remains
unchanged.

THE ORTHODOX POLICIES TO REDUCE UNEMPLOYMENT

- To reduce unemployment, orthodox economists believe that governments should reduce labour market rigidities
- These rigidities include:
 - Minimum-wage laws
 - Overly strong labour unions
 - Employment insurance programs
 - Others laws that protect workers
 - Payroll taxes
- Empirical evidence supporting this view are hard to come by
- In their view, expansionary fiscal policies will have only temporary effects and will cause inflation

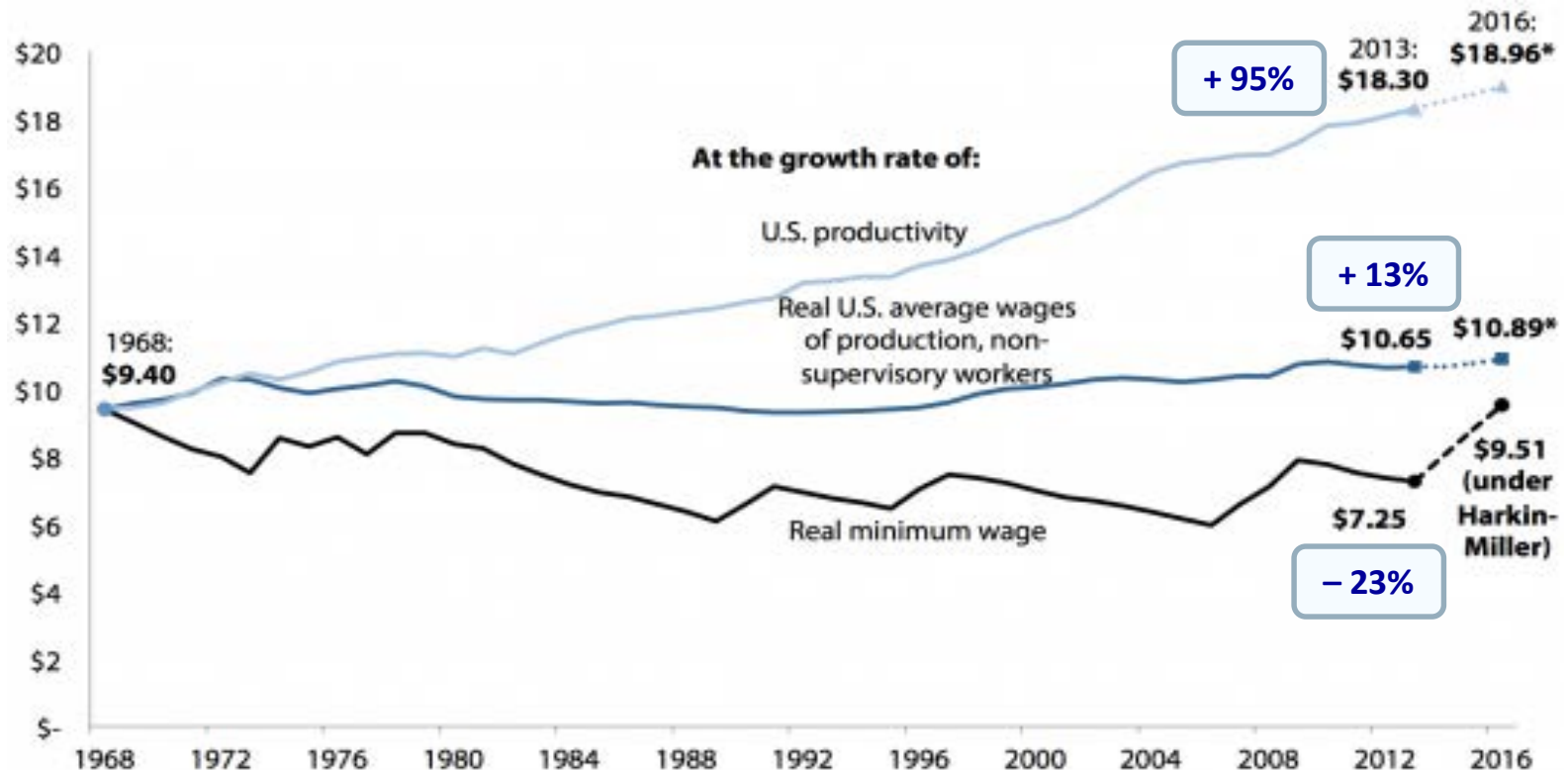
THE KEYNESIAN VIEW OF UNEMPLOYMENT

- Unemployment arises because of a lack of aggregate demand
 - Therefore, unemployment is essentially *involuntary*
- Reduction in any of the components of aggregate demand (including *consumption*) will cause unemployment to rise
- The higher the propensity to consume, the higher aggregate demand and, therefore, the lower the rate of unemployment
- But consumption also depends on *real wages* because the overall propensity to consume depends on the distribution of income
 - The propensity to consume out of profits is lower than the propensity to consume out of wages

THE KEYNESIAN VIEW OF UNEMPLOYMENT (CONT'D)

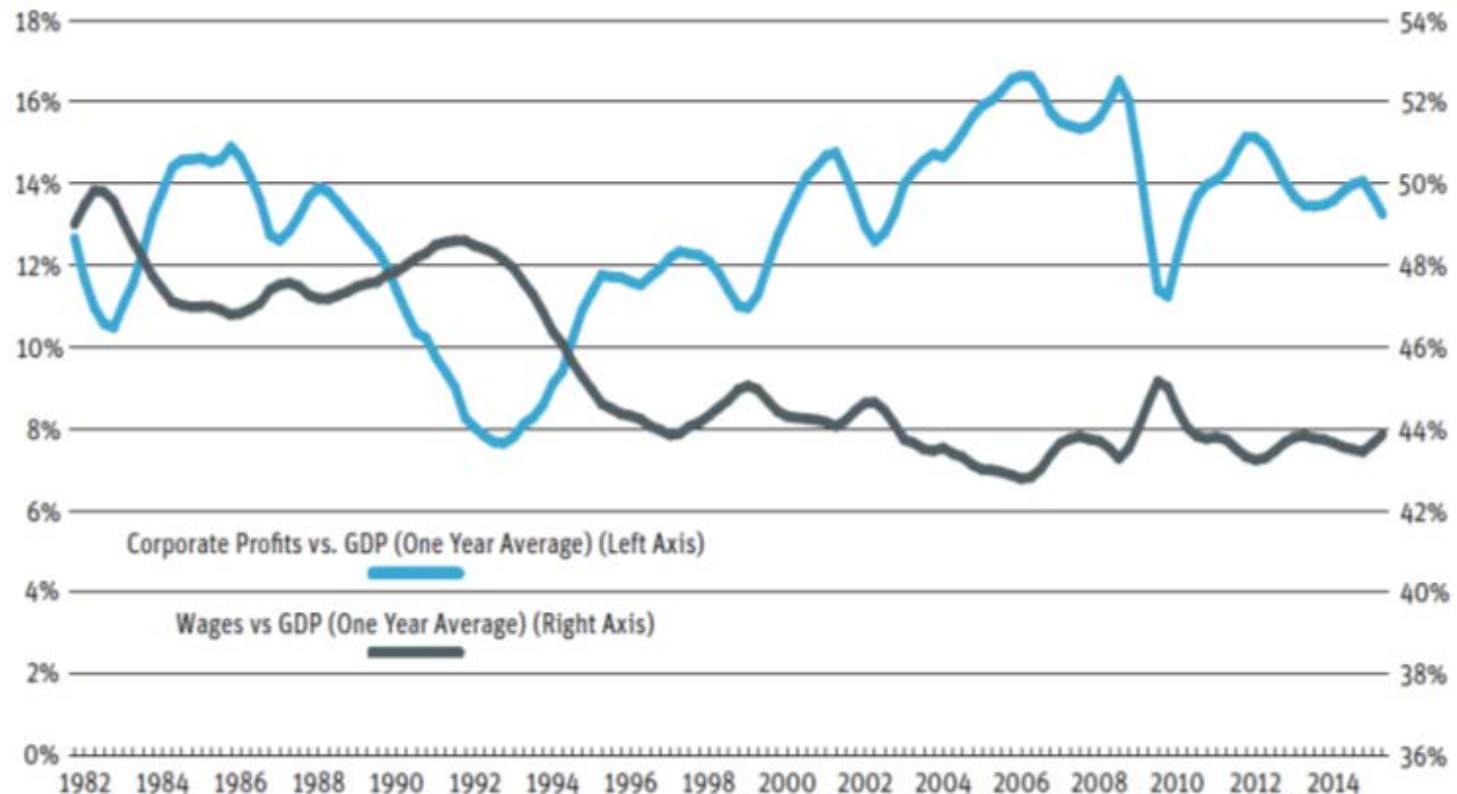
- Income redistribution toward wages will increase the overall propensity to consume
 - Therefore, aggregate demand and employment will increase
- Higher real wages will have a negative impact on employment only if they cause a reduction in investment by cutting the profit perspectives of the firms
- As long as the positive effect on consumption overcomes the possible negative effect on investment, higher real wages will have a positive effect on aggregate demand and employment
 - ***This is contrary to the neoclassical view that employment would fall with increases in real wages***

U.S.: REAL MINIMUM WAGE 1968–2016, CONSTANT 2013 DOLLARS



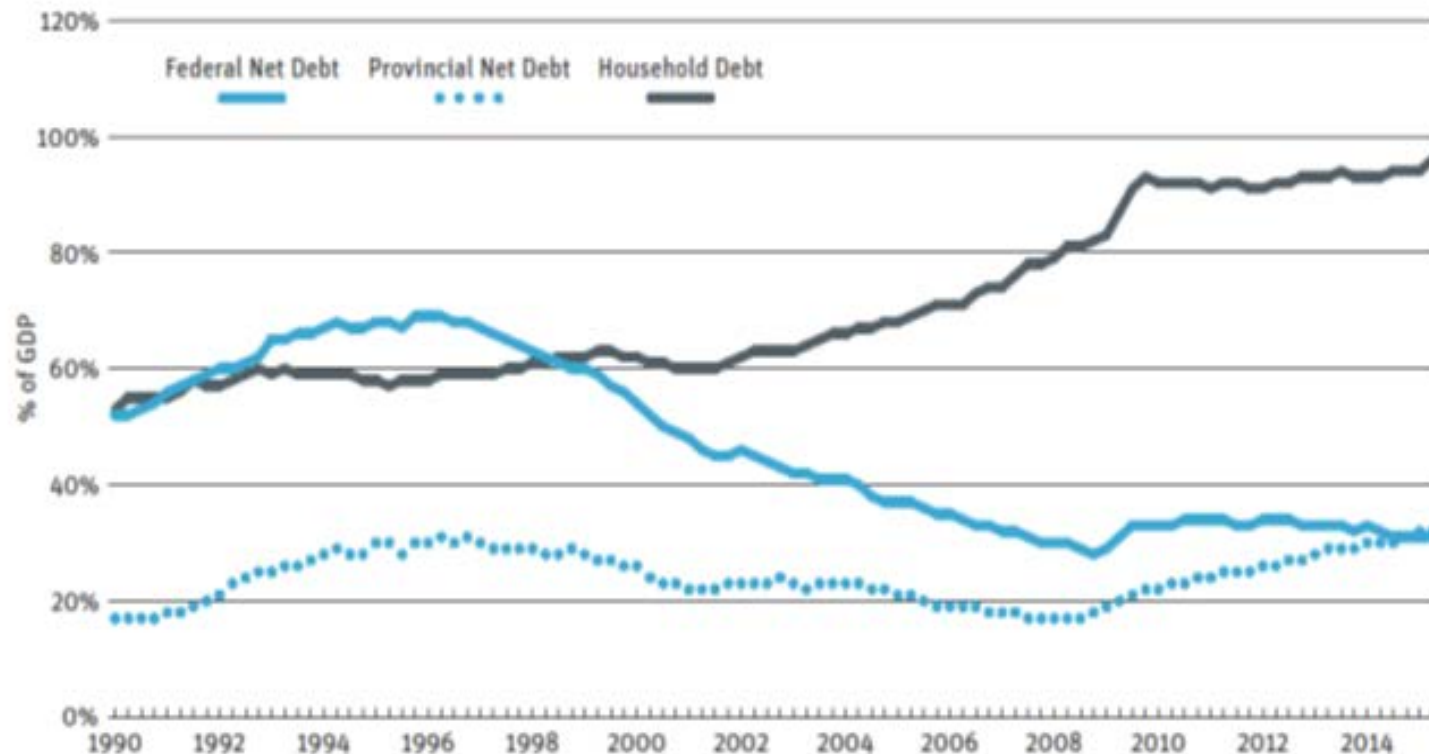
Source: David Cooper, “Raising the Federal Minimum Wage to \$10.10 Would Lift Wages for Millions and Provide a Modest Economic Boost,” Economic Policy Institute, 19 December 2013.

CANADA'S SHARE OF PROFITS AND WAGES IN GDP, 1982-2015



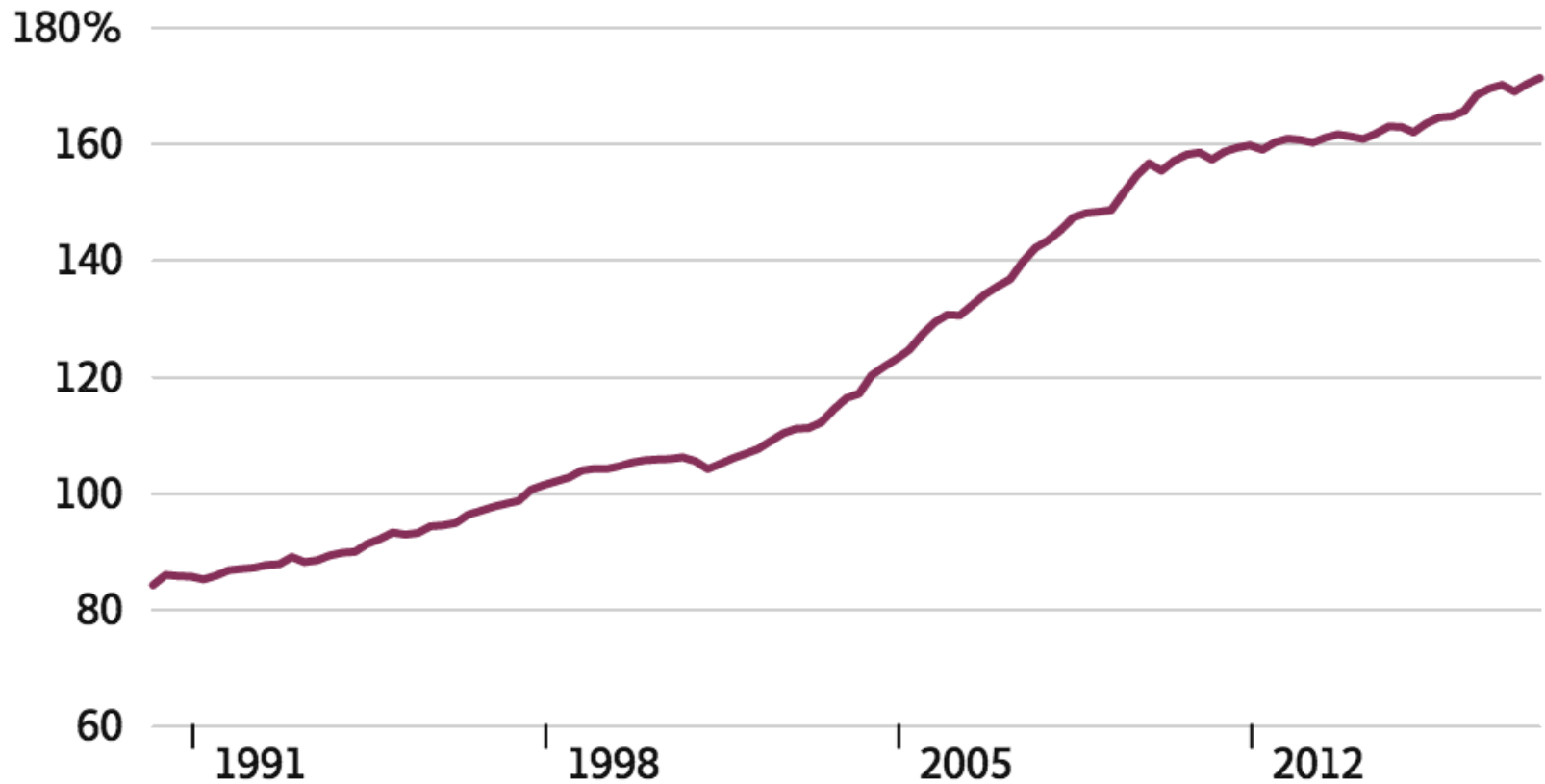
Source: Canadian Centre for Policy Alternatives, *2016 Alternative Federal Budget*, 2016.

CANADA'S PRIVATE AND PUBLIC DEBT AS PERCENTAGE OF GDP, 1990-2015



Source: Canadian Centre for Policy Alternatives, *2016 Alternative Federal Budget*, 2016.

CANADA'S RATIO OF HOUSEHOLD DEBT TO DISPOSABLE INCOME, 1990-2017



THE GLOBE AND MAIL, SOURCE: STATSCAN

THE “SOCIOLOGICAL” VIEW OF UNEMPLOYMENT

- Ultimately society, not the economy, determines how many people are out of work
- The problems of unemployment, under-employment, and unsatisfactory employment stems from three main flaws:
 - Misuse of gains in labour productivity
 - Employers lack flexibility for alternative work schedules
 - Mismatch between the kinds of jobs supplied by the economy and the kind of jobs that society really needs
- What could be done to eliminate *involuntary* unemployment?
 - Better income distribution between capital and labour
 - Work-time reduction
 - Guaranteed jobs