# Business Cycles

## - Exercise 6 -

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University of Würzburg

27.06.2022

# The Neoclassical Model - The Effect of Shocks

# 1. and 2. Classical Dichotomy

**Question:**

- Can you provide any intuition for the neutrality of money in the neoclassical model? Do you think monetary neutrality is a good benchmark when thinking about the real world?
- Define what is meant by the "classical dichotomy". If the classical dichotomy holds, can we ignore nominal variables when thinking about the real effects of changes in real exogenous variables?

# 1. and 2. Classical Dichotomy

Intuition **money neutrality:**

- Changes in $M_t$ just changes the measurement of the units of account
- Money is modeled just as an intermediary
- Important is the real value - how much time one has spent to get a certain purchasing power

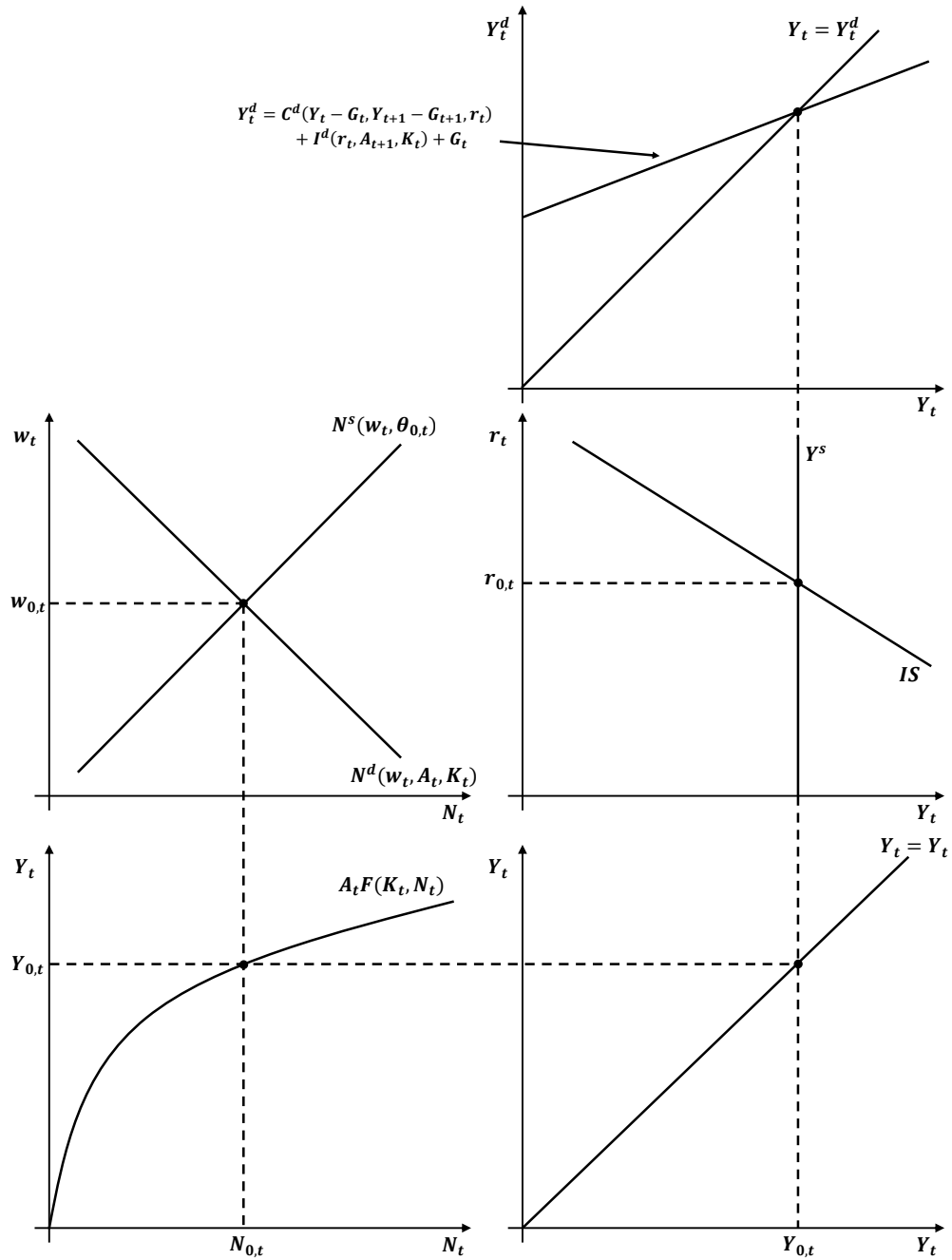
**Classical dichotomy**

- Real variables are determined in equilibrium independently of nominal variables (but not vice versa!)

**Question:**
Consider the basic Neoclassical model. Suppose that there is an increase in $\theta_t$.

a) Graphically analyze this change and describe how each endogenous variable changes.

# 3. Labor Supply Shock



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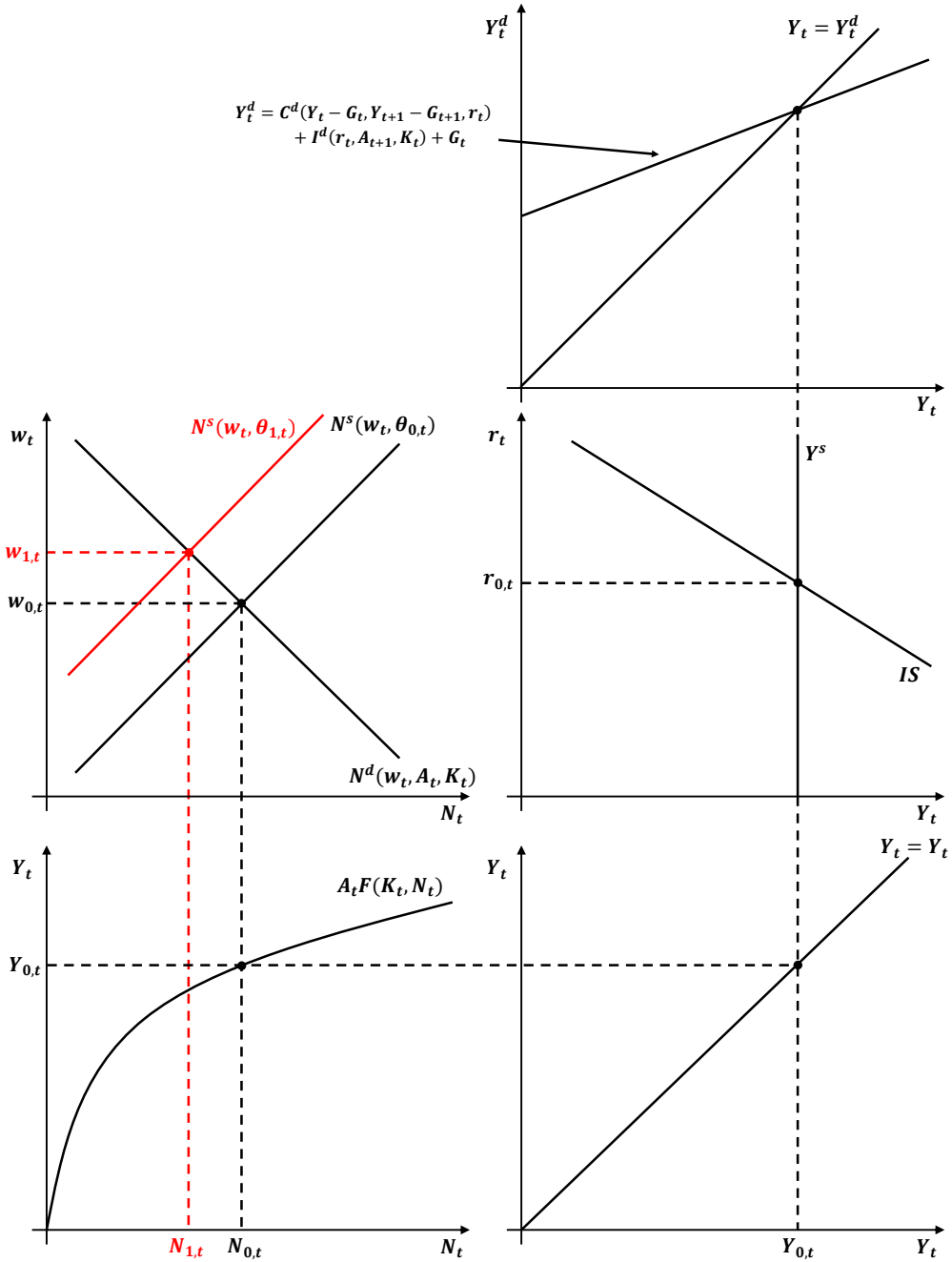

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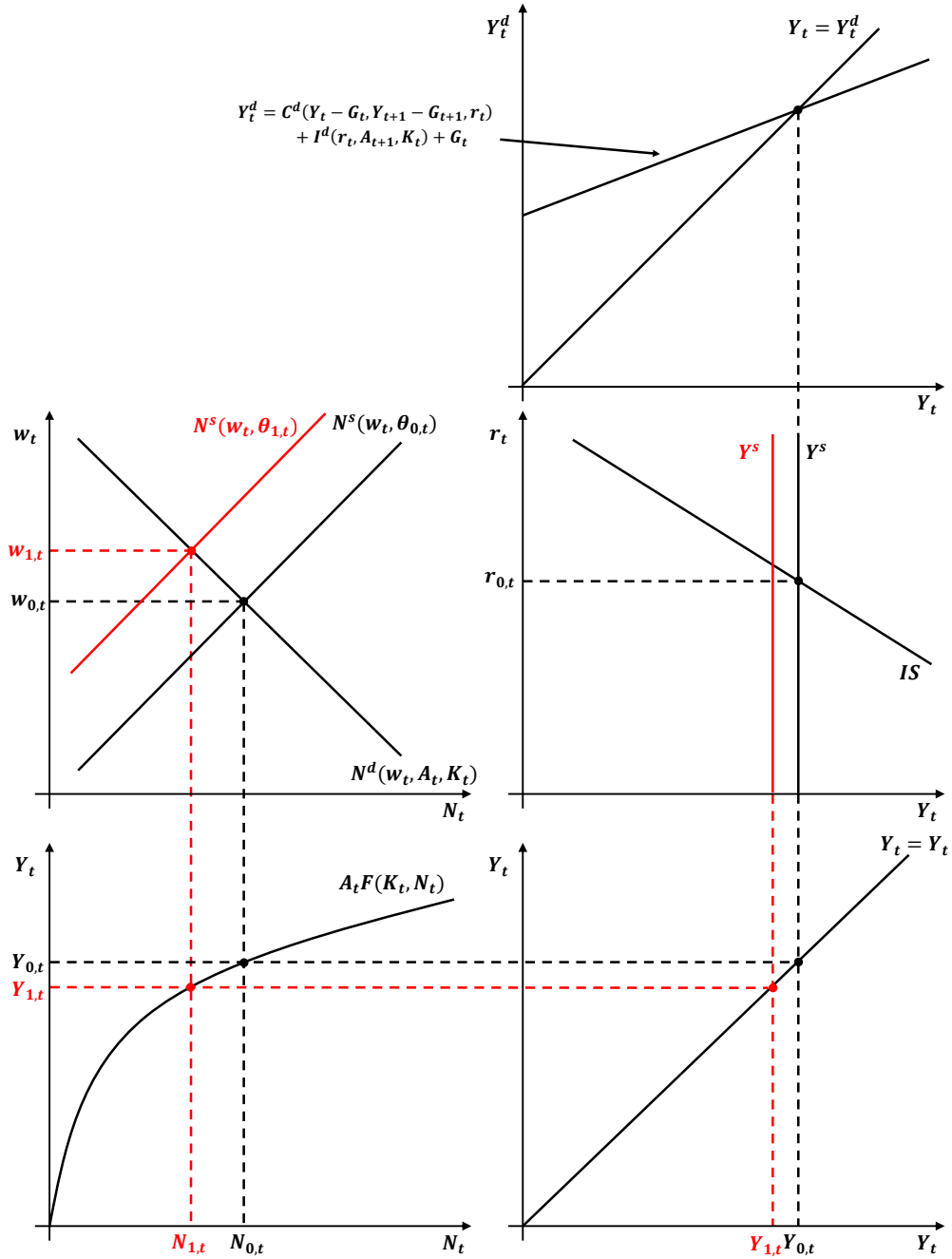

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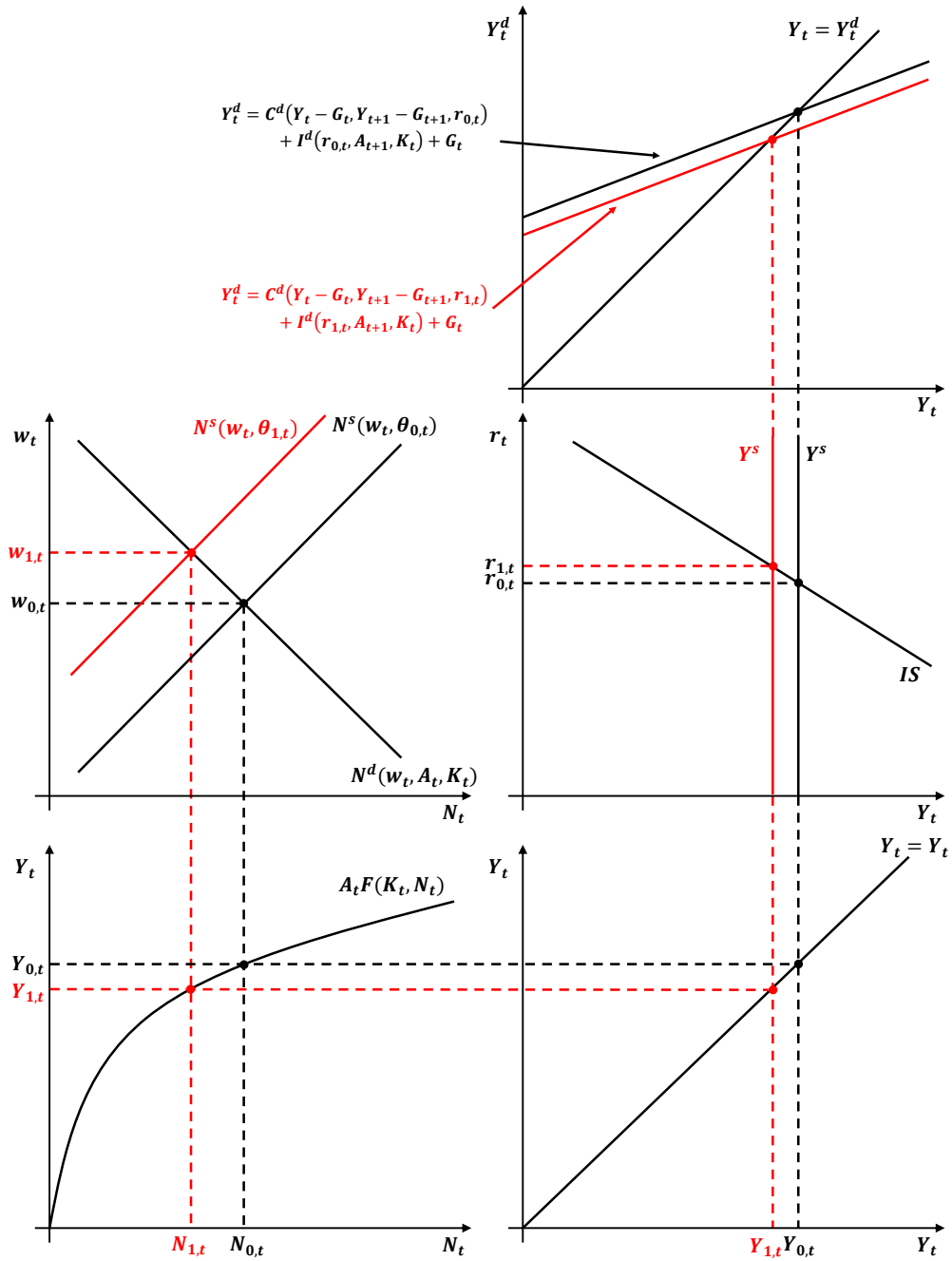
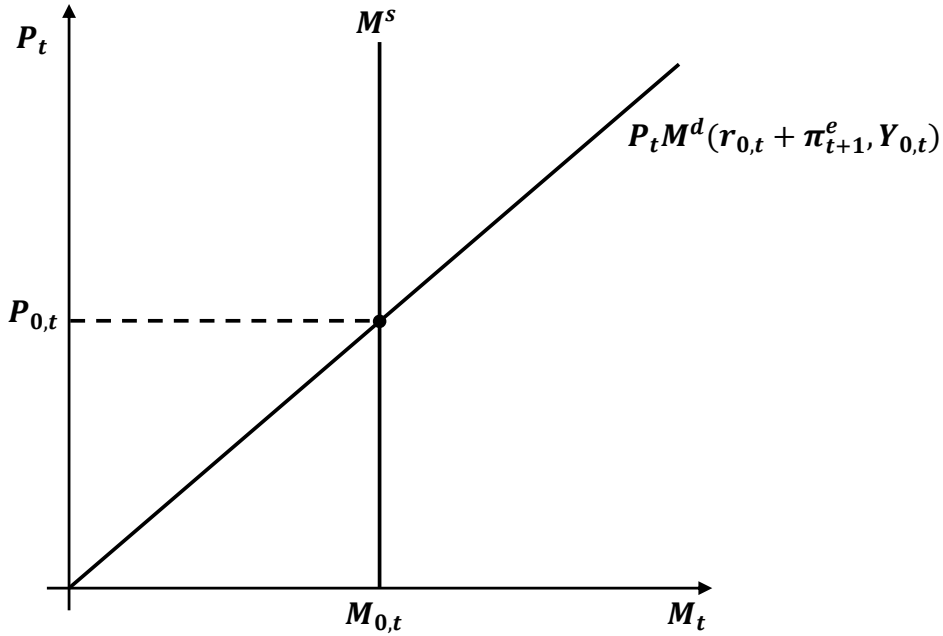


**Increase in $\theta_t$**

- Labor supply curve shifts to the left (for given level of $w_t$ households are less willing to work) $\Rightarrow N_t \downarrow, w_t \uparrow$
- Given the production function, lower labor input leads to a lower level of output $Y_t$ on the supply side
- Since the value of $Y_t$ from the supply side is independent of $r_t$, the vertical $Y^s$ curve shifts to the left
- Given that there is no direct effect of $\theta \uparrow$ on the demand side, the IS curve remains unchanged $\Rightarrow$ the lower level of $Y^s$ leads to a rise of $r_t$ (lower level of output must translate into lower expenditures $\Rightarrow$ the real interest rate must rise to induces the households (firms) to consume (invest) less
- The higher $r_t$ causes a decrease in consumption and investment expenditures $\Rightarrow$ the expenditure line shifts down $\Rightarrow$ income equals expenditures at a new lower level $Y_{1,t}$

## Money market



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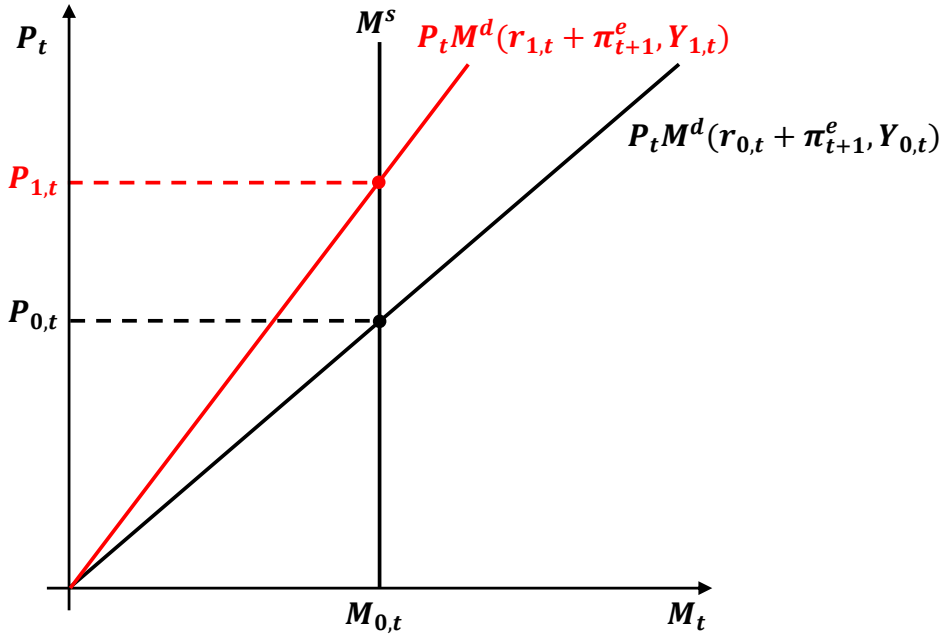

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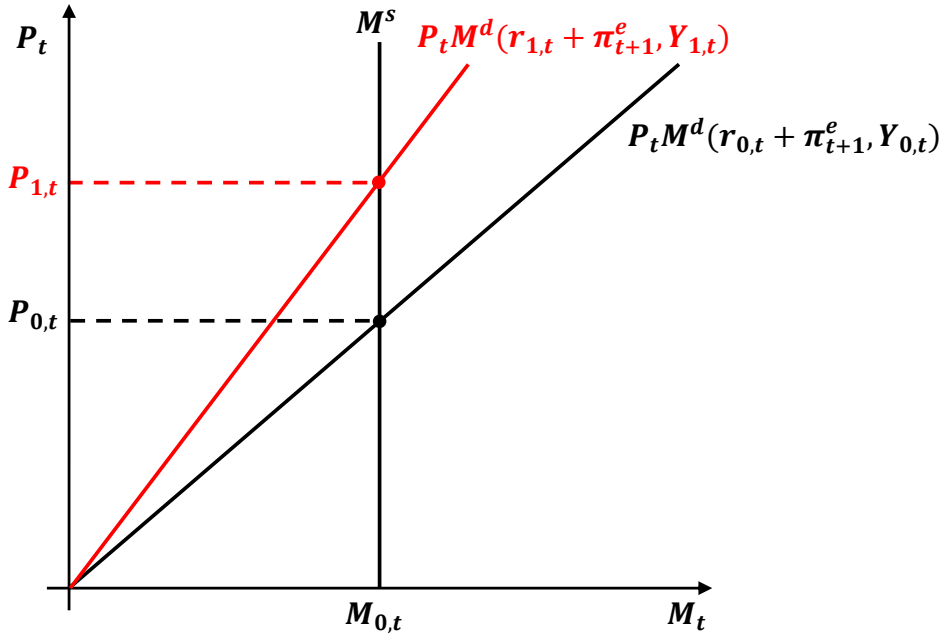
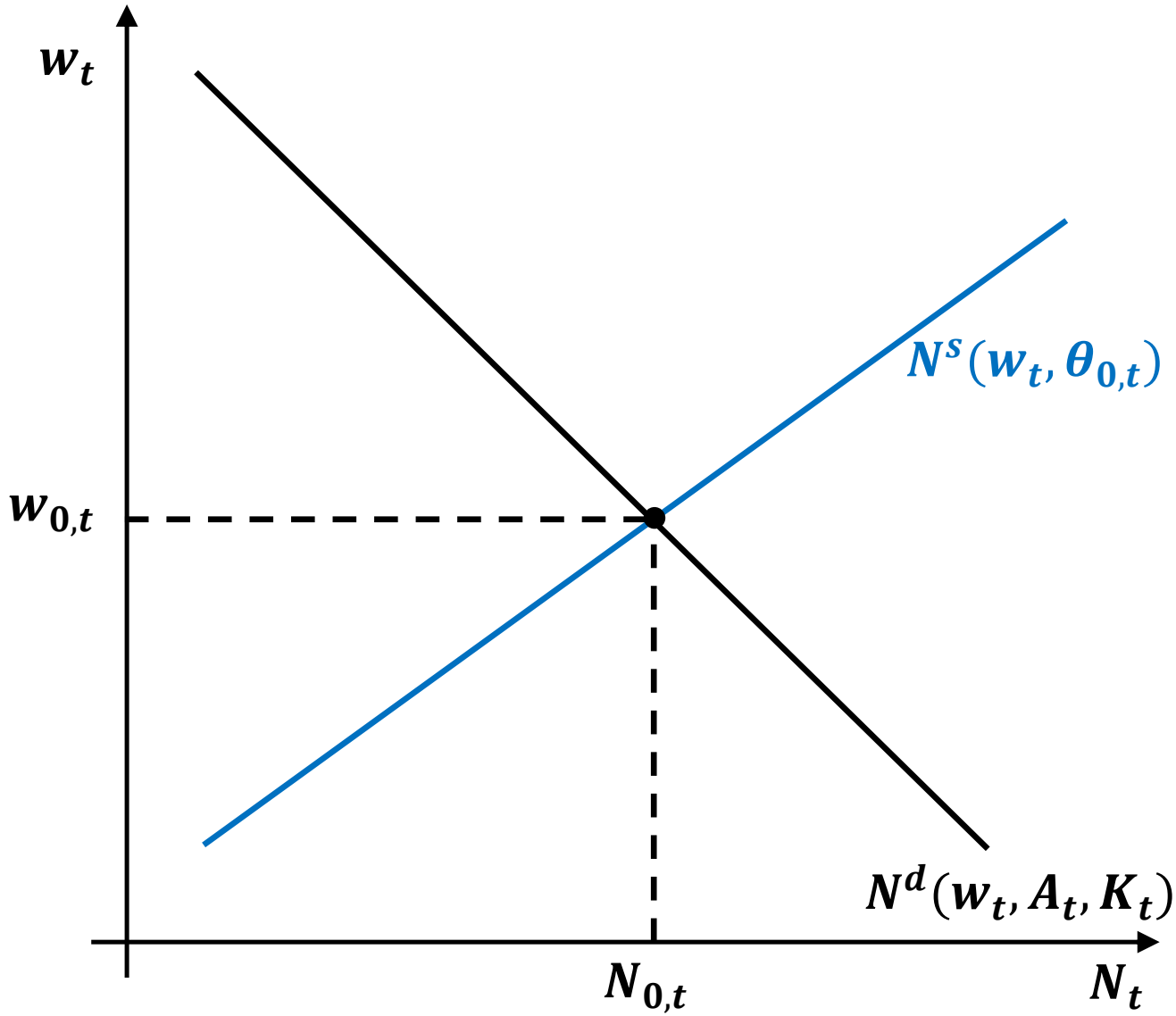



- Since $\pi^e_{t+1}$ is exog., $r_t \uparrow$ translates into $i_t \uparrow$
- Higher $i_t$ leads to a decrease in money demand, as does the lower income $Y_t \Rightarrow$ money demand curve rotates to the left
- The price level has to rise so that the money market is in equilibrium

**Question:**
Consider the basic Neoclassical model. Suppose that there is an increase in $\theta_t$.

b) Now, draw out two versions of the model, one in which labor supply is relatively elastic (i.e. sensitive to the real wage), and one in which labor supply is relatively inelastic (i.e. relatively insensitive to the real wage). Comment on how the magnitudes of the changes in $Y_t$, $r_t$, $w_t$, and $N_t$ depend on how sensitive labor supply is to the real wage.

# 3. Labor Supply Shock



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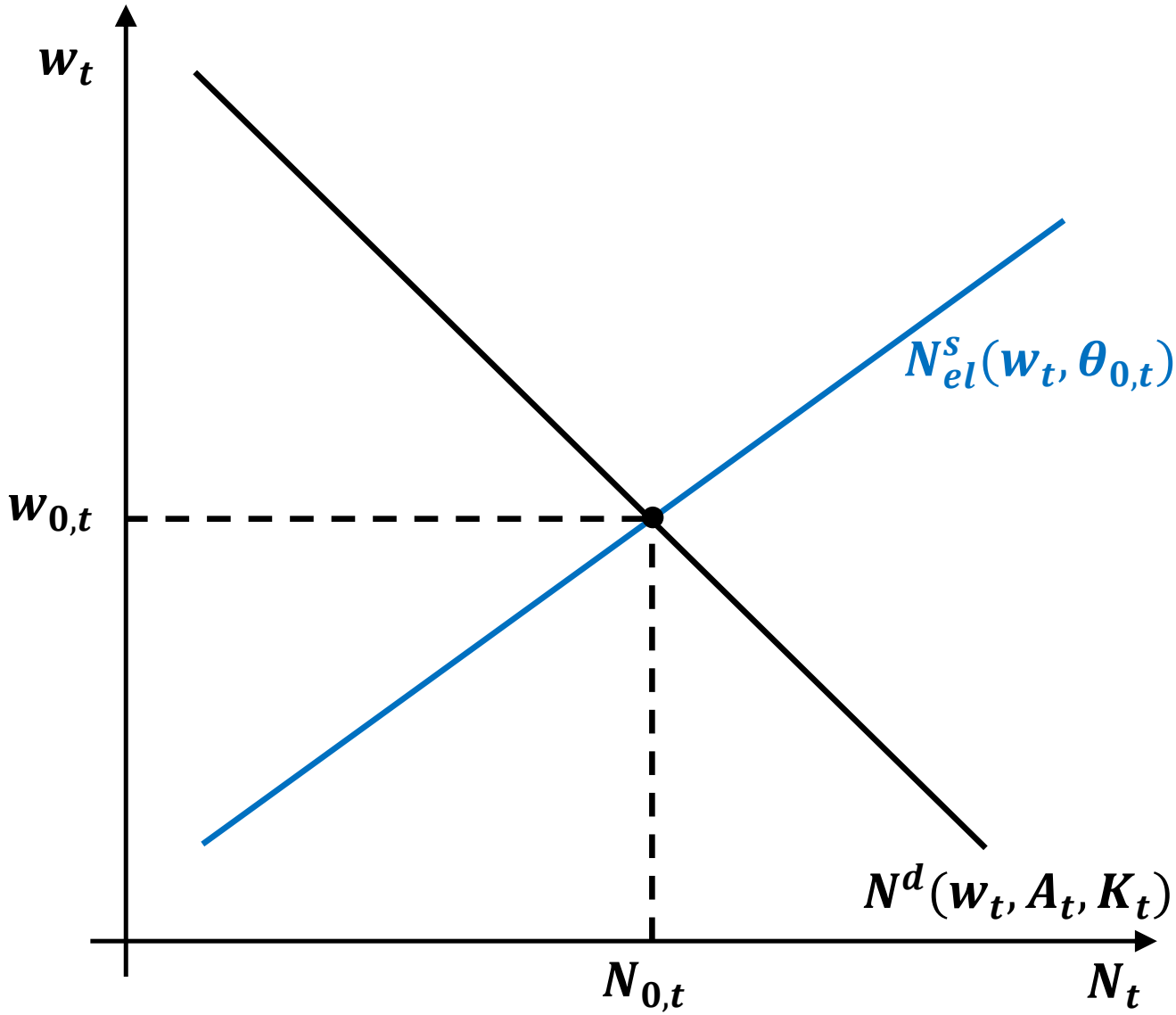

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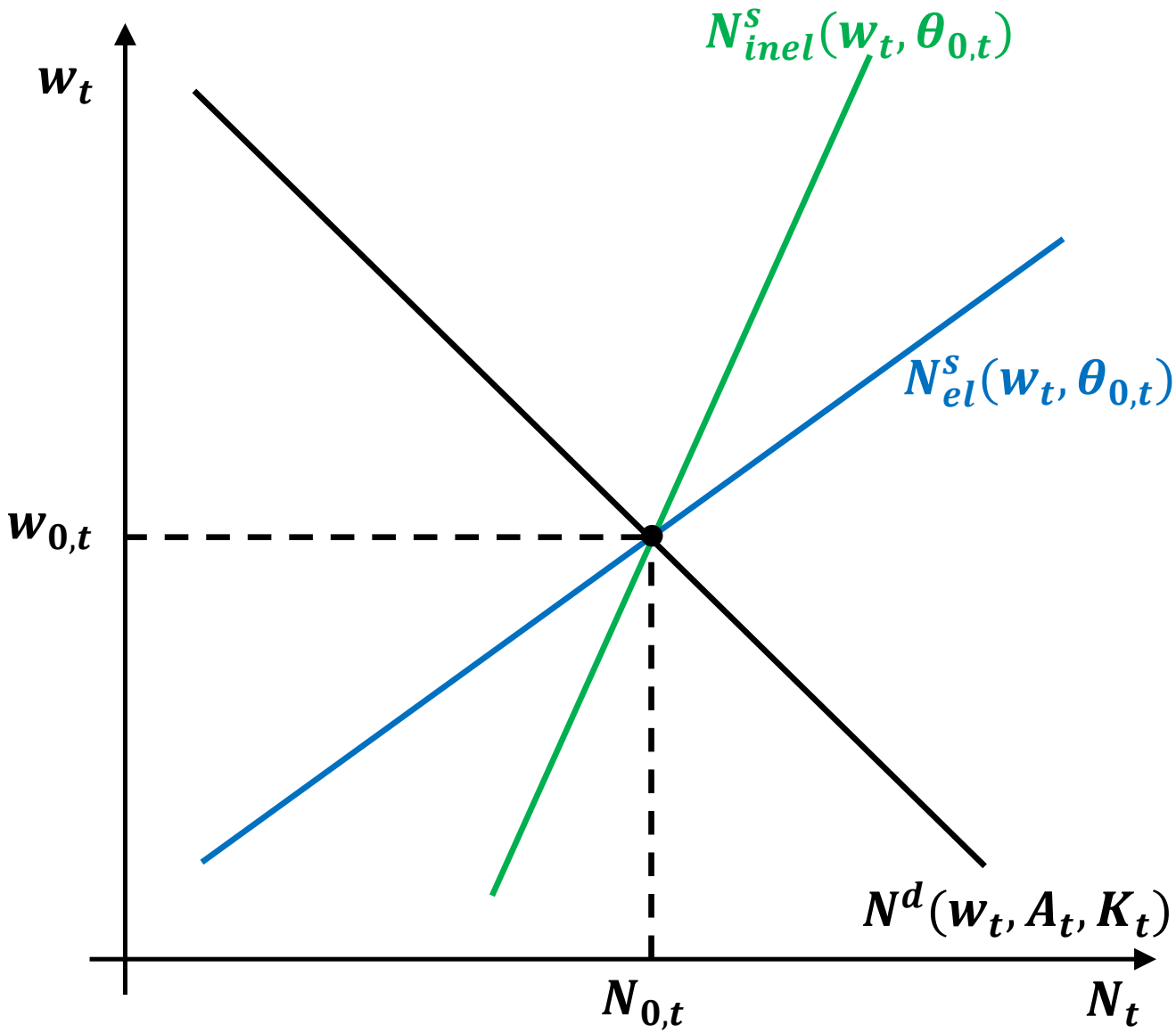

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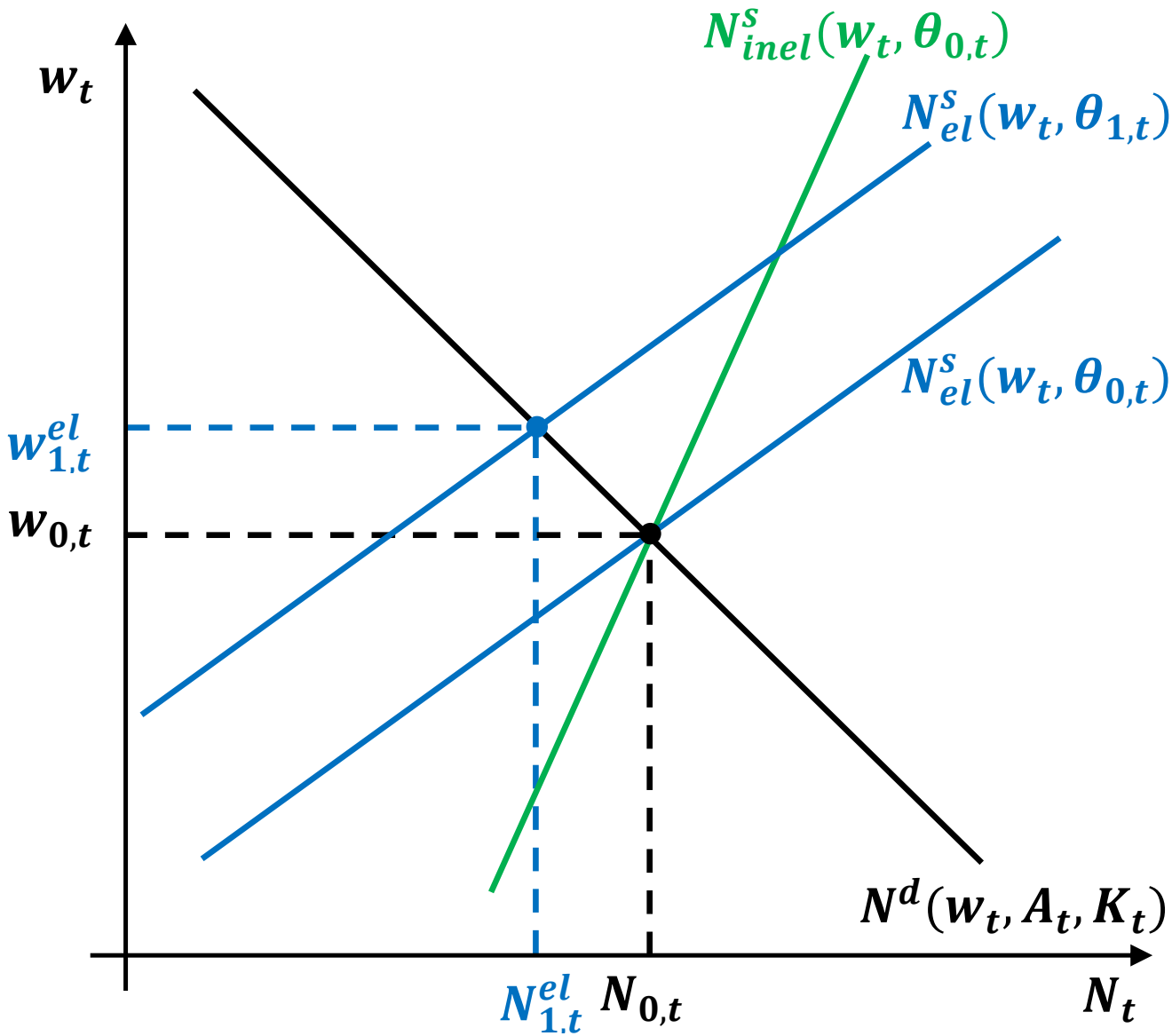

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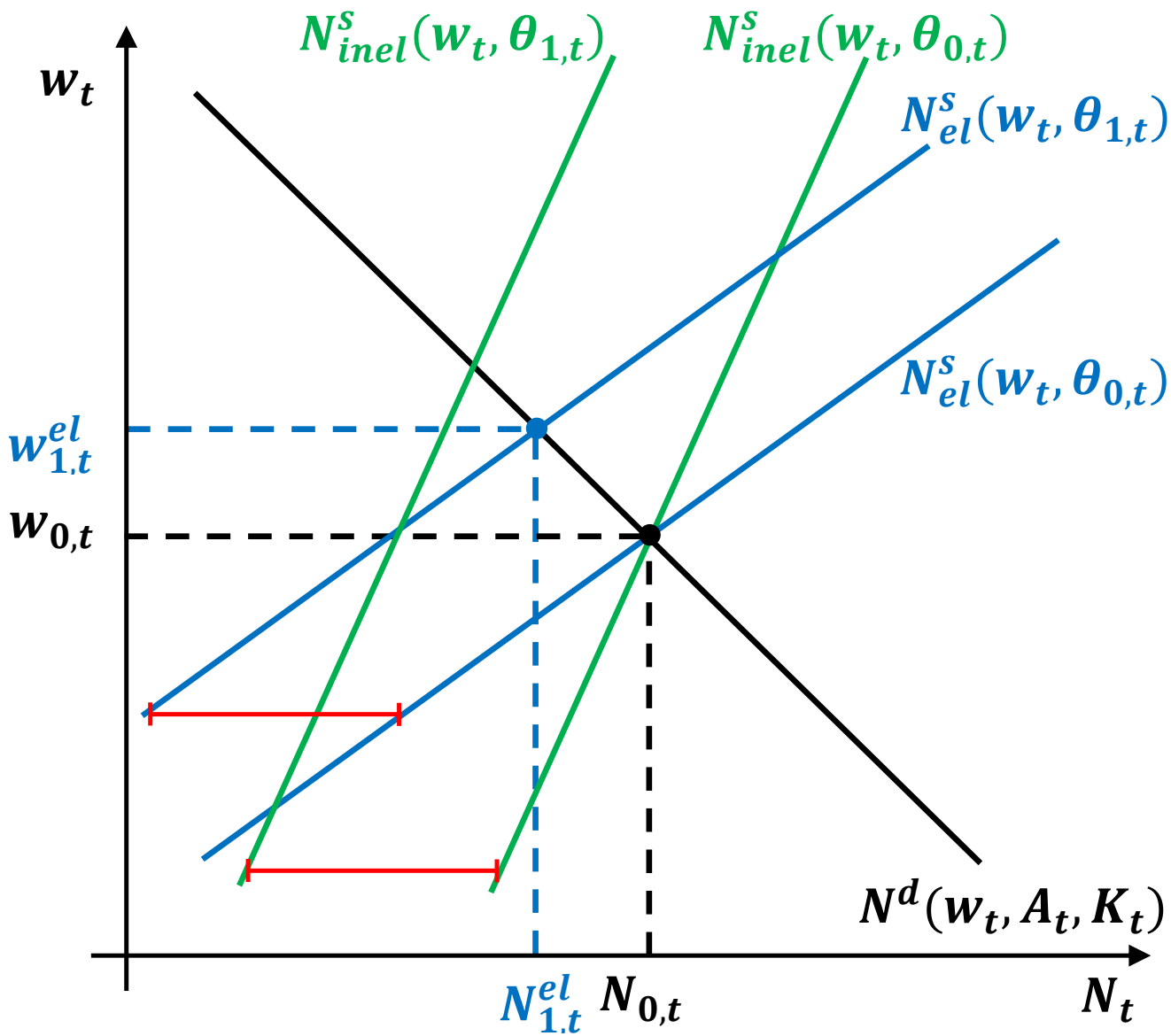

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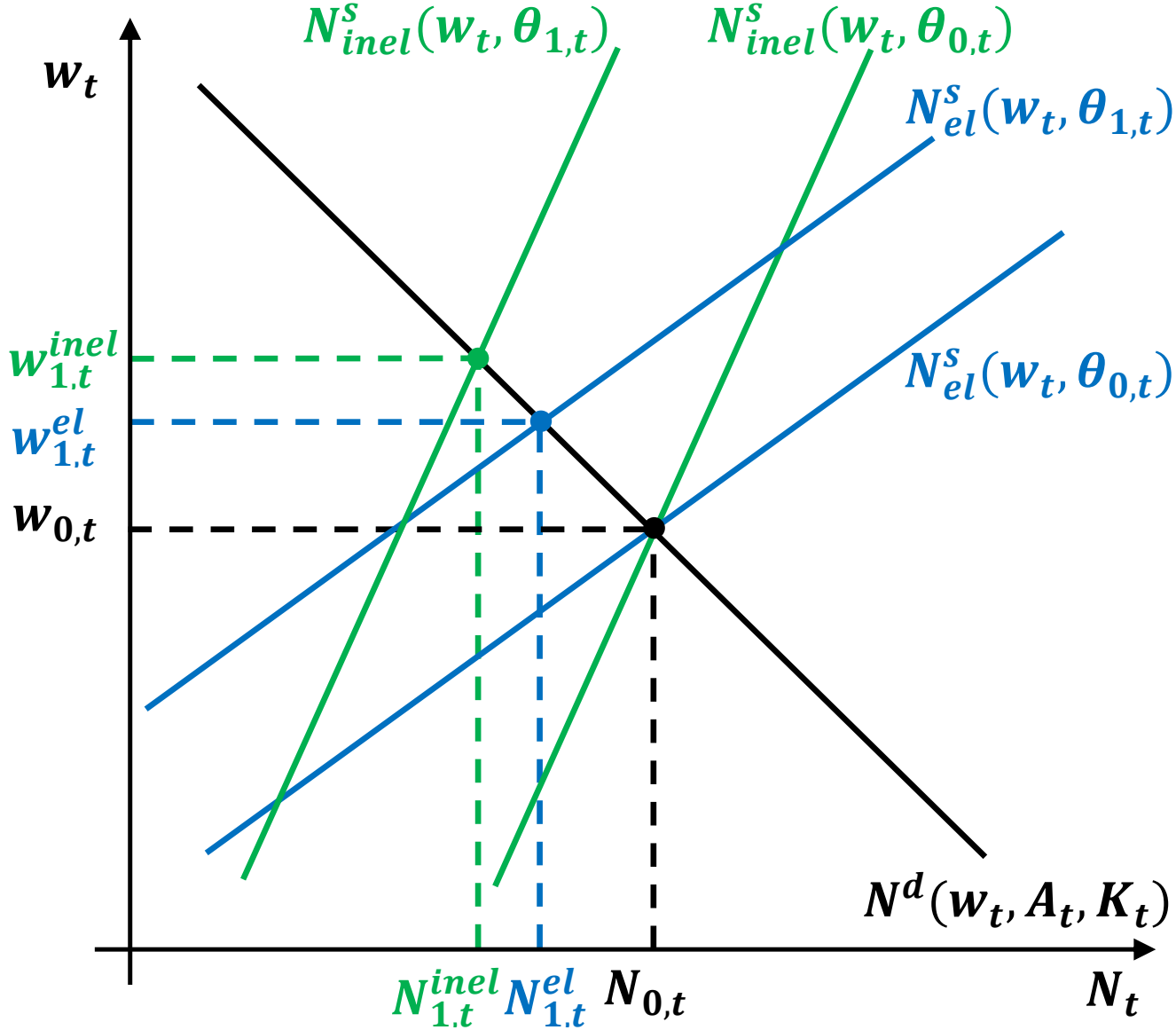
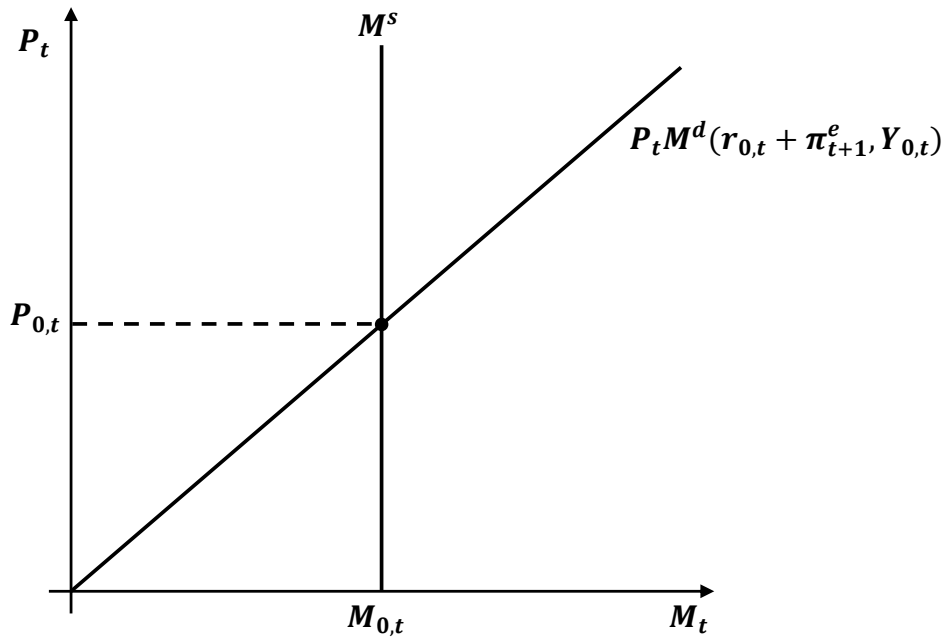


# 3. Labor Supply Shock

- In case of relative elastic labor supply, decrease in $N_t$ and increase in $w_t$ less pronounced $\Rightarrow$ substitution effect is stronger
- The response of $w_t$ to a change in $\theta$ dampens the decrease in $N_t$ $\Rightarrow$ the more sensitive labor supply is to changes in $w_t$ the smaller is the effect of $\theta$ on $N_t$
- The smaller the effect of $\theta$ on $N_t$, the smaller is the effect on $Y_t$ and $r_t$

**Question:**
Consider the basic neoclassical model. Suppose that there is a reduction in $A_t$. In which direction will $P_t$ move? Will it change more or less if money demand is less sensitive to $Y_t$?

## Money market



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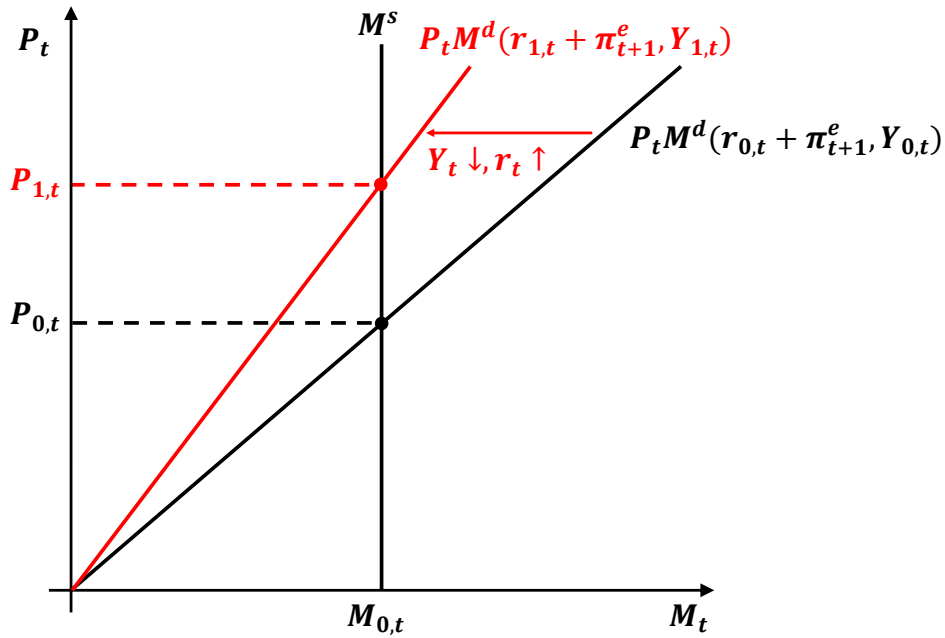


- Rationale: $A_t \downarrow \rightarrow Y_t \downarrow \rightarrow r_t \uparrow \rightarrow i_t \uparrow \rightarrow M^d \downarrow$
- Since both $i_t \uparrow$ and $Y_t \downarrow$ lead to $M^d \downarrow$ and $P_t \uparrow$, a higher sensitivity of $M^d$ on $Y_t$ would lead to a more pronounced rise in $P_t \uparrow$

**Question:**
Consider the basic Neoclassical model. Graphically analyze the effects of:

a) An increase in $G_{t+1}$.

b) An increase in $A_{t+1}$.

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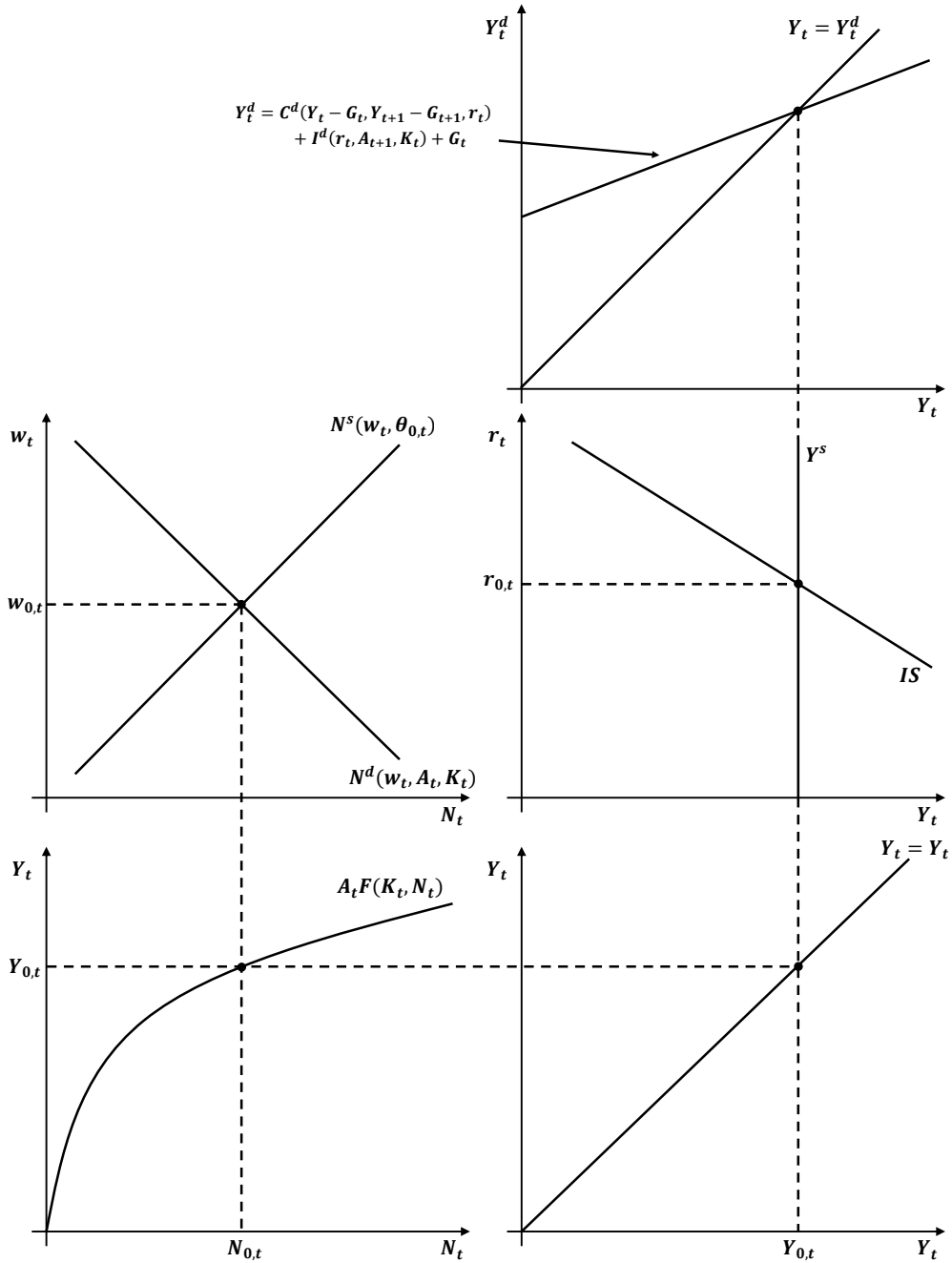
- Demand shocks affect the composition of output, not the level of output (determined by the supply side)

# 5. Demand Shock: $G_{t+1} \uparrow$



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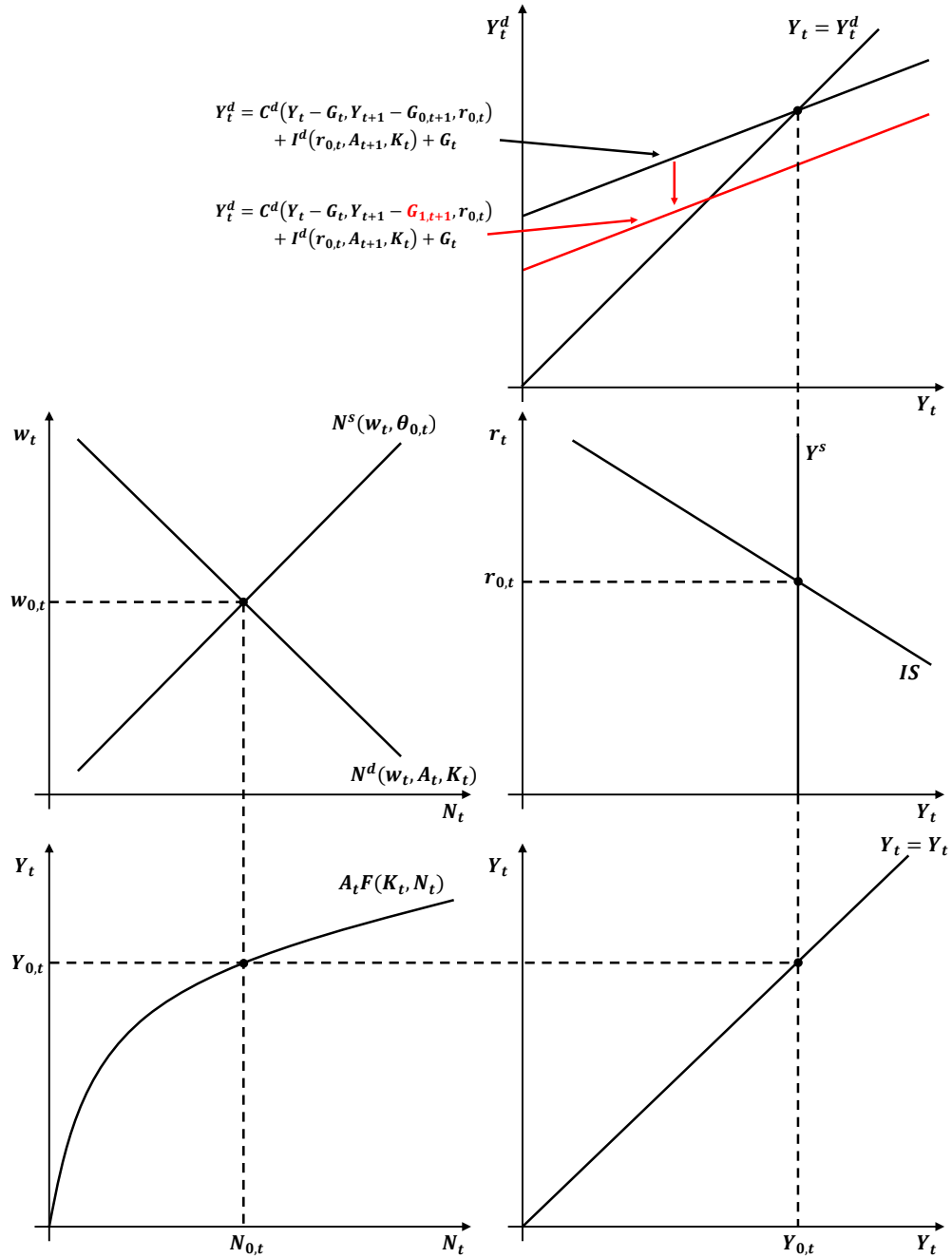

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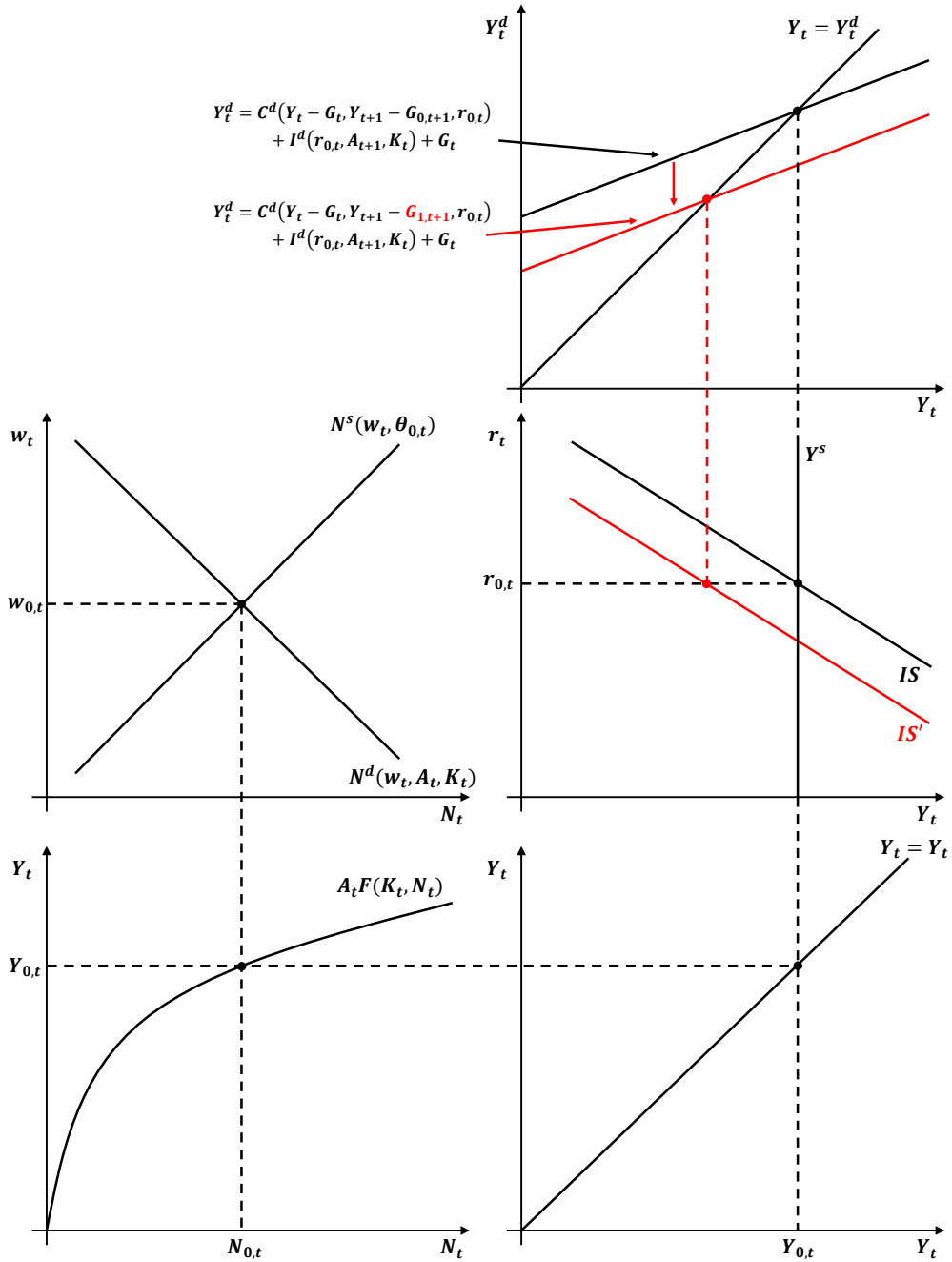

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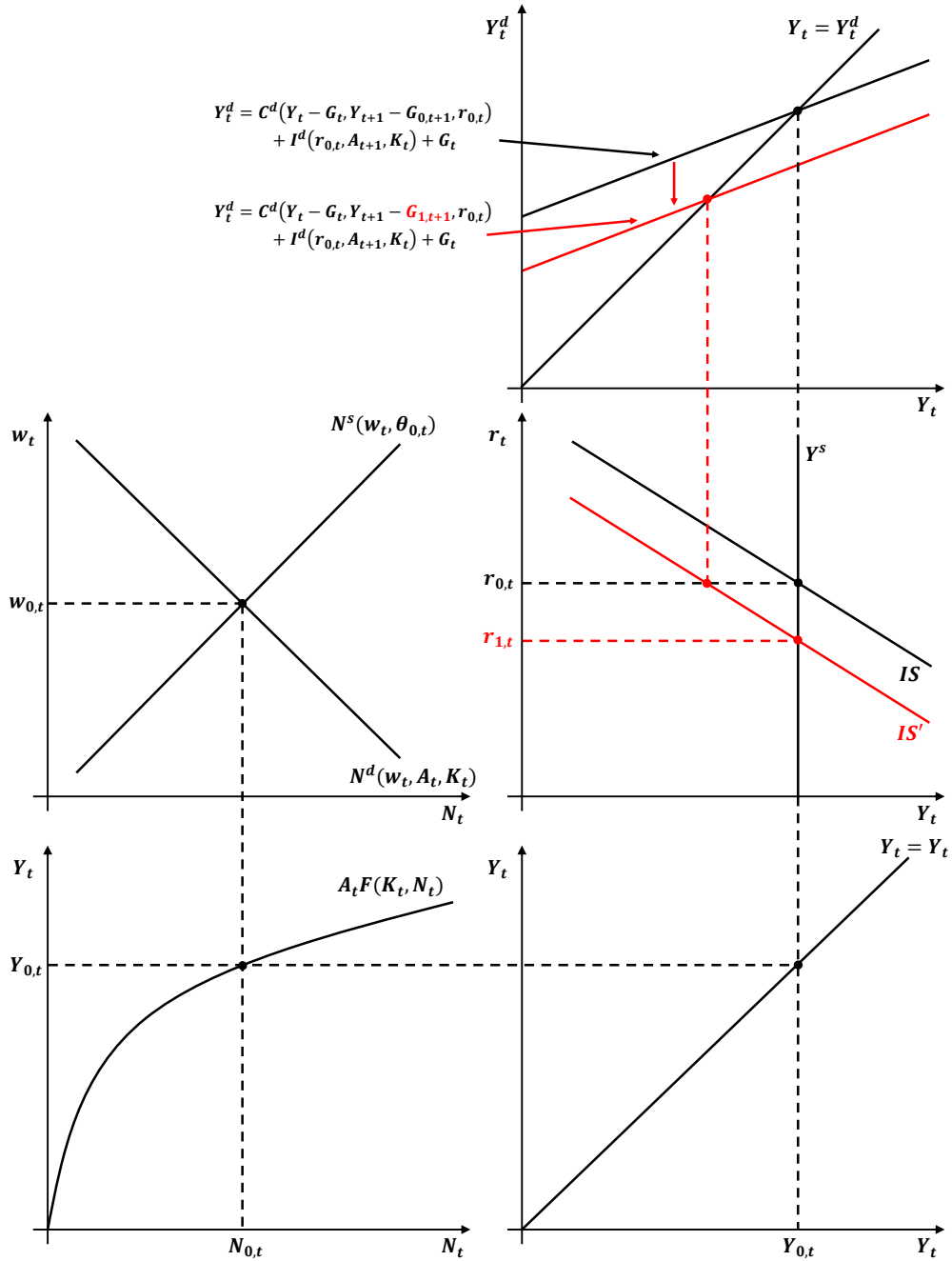

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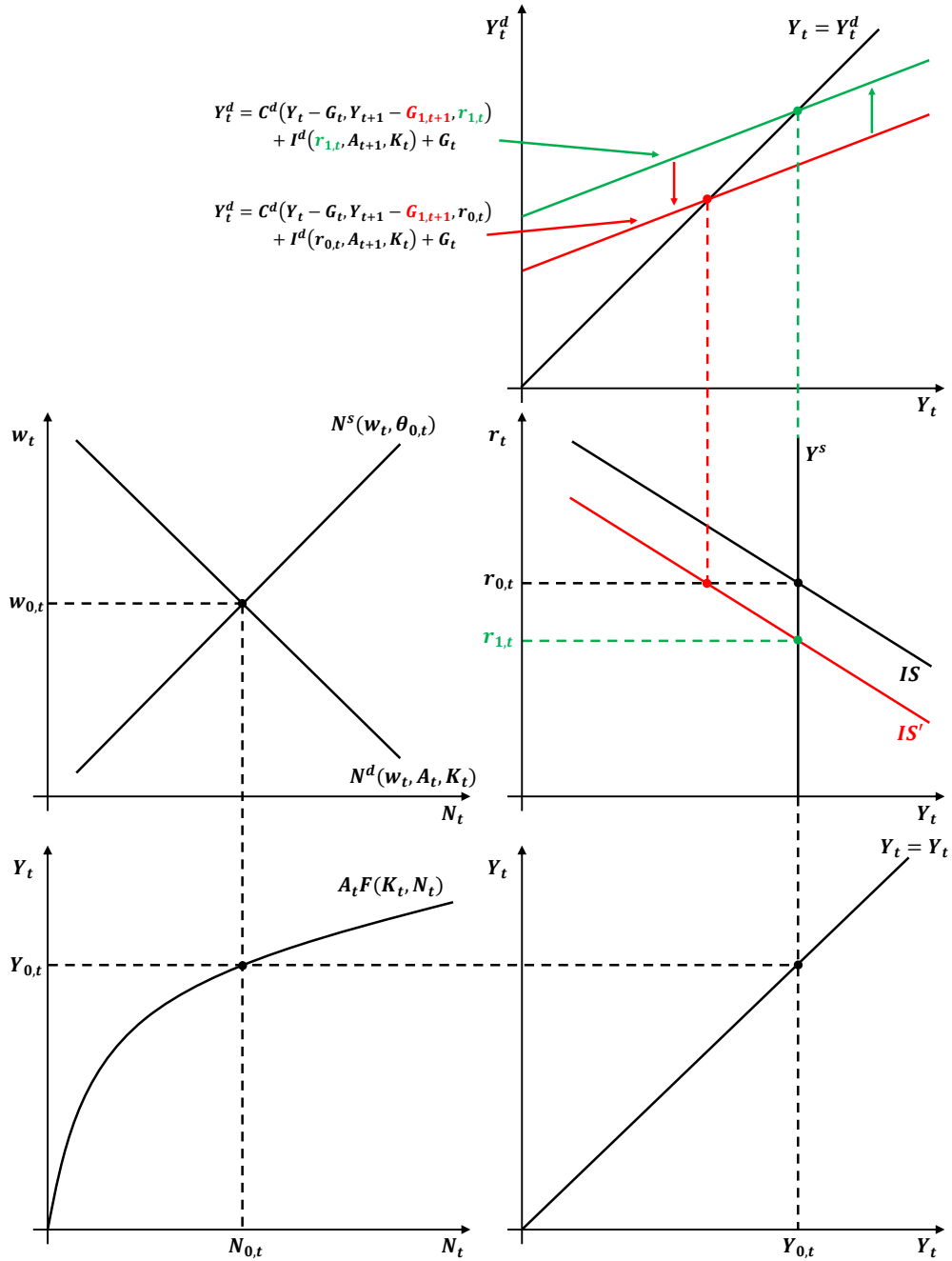
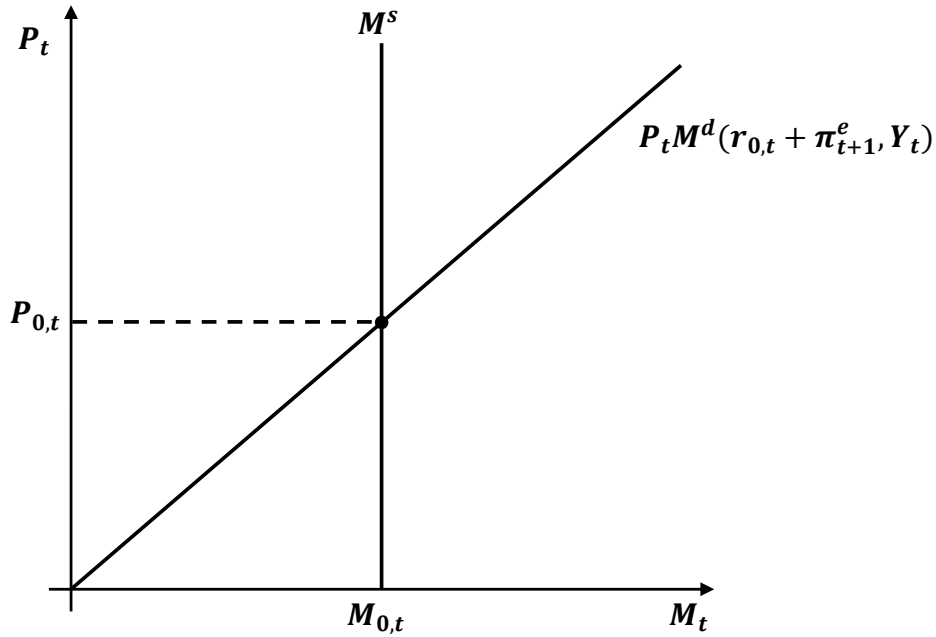


# 5. Demand Shock: $G_{t+1} \uparrow$

**Anticipated increase in future government spending:**

- Assuming Ricardian Equivalence holds, it is irrelevant how $G_{t+1} \uparrow$ is financed
- Affects current autonomous expenditures through consumption $\Rightarrow$ expenditure line shift down (for given $r_t$) $\Rightarrow$ IS curve shifts left
- Supply side remains unaffected $\Rightarrow$ $Y^s$ stays the same
- $r_t$ has to fall $\Rightarrow$ autonomous expenditures increase $\Rightarrow$ expenditure line shifts back to initial position
- In Equilibrium: no change in $Y_t^d$ or $Y_t$ but $C_t \downarrow$ and $I_t \uparrow$

## Money market



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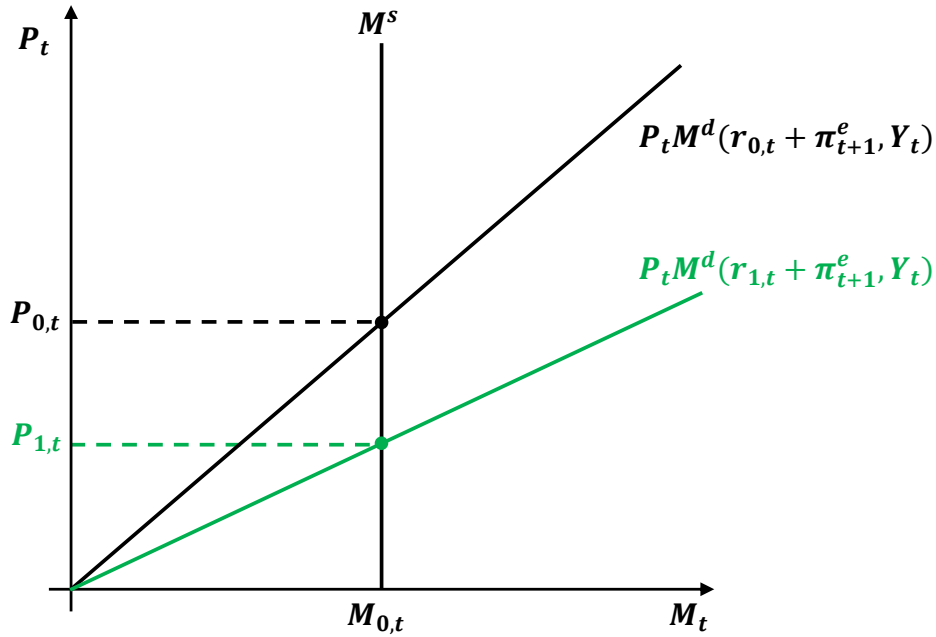
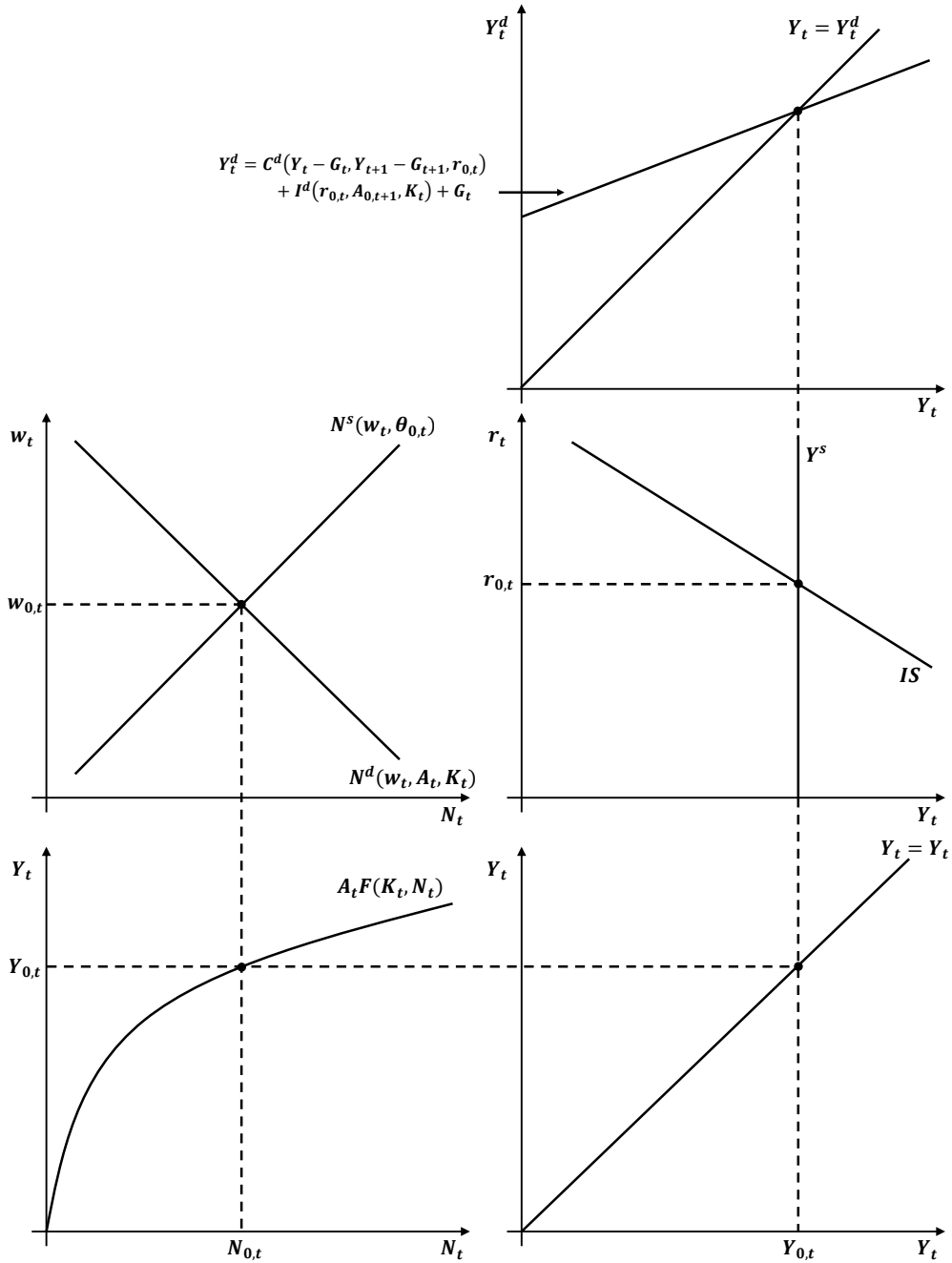



- No change in $Y_t$ but lower $r_t \Rightarrow$ money demand curve becomes flatter
- $P_t$ decreases

# 5. Demand Shock: $A_{t+1} \uparrow$



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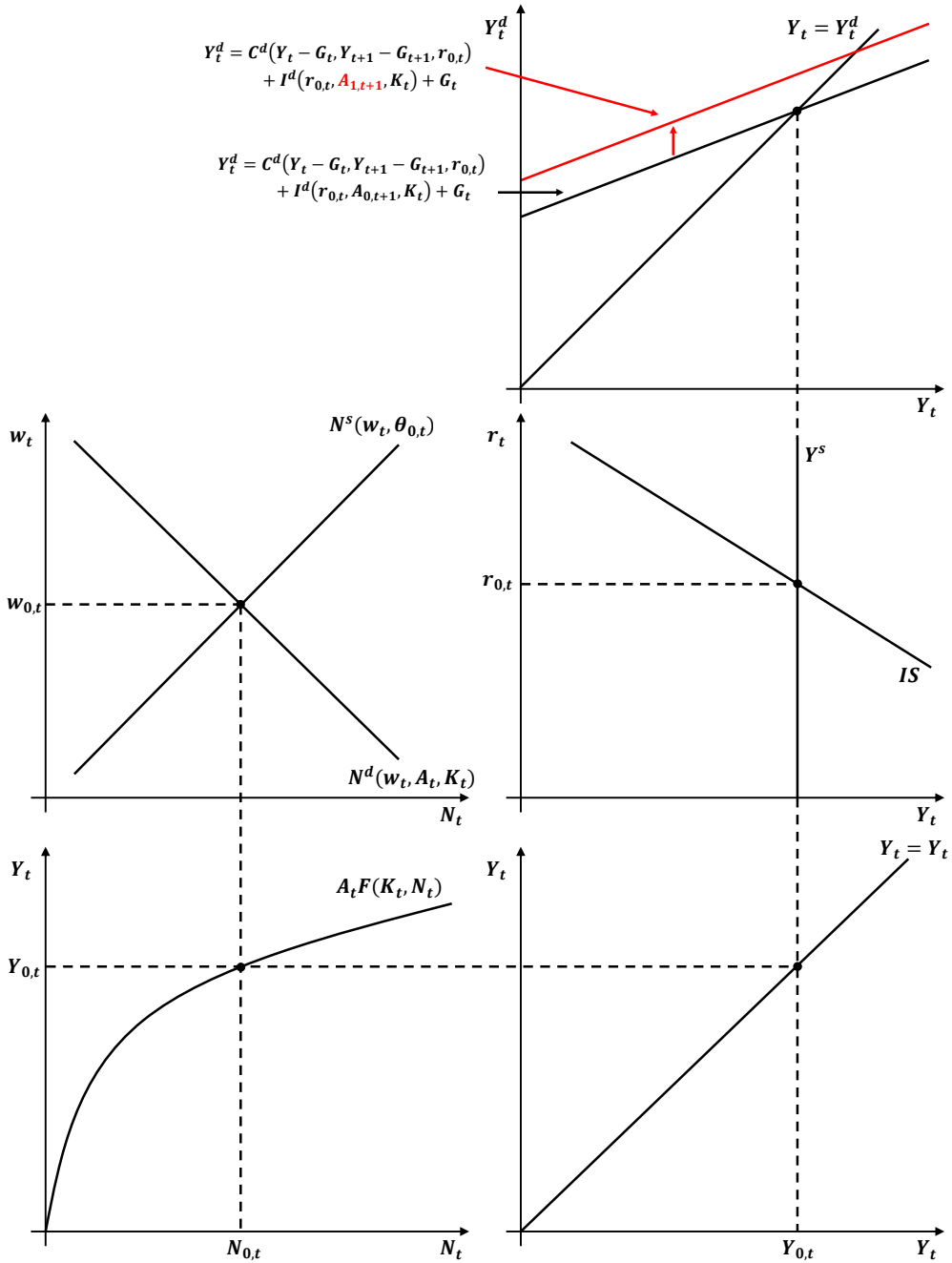

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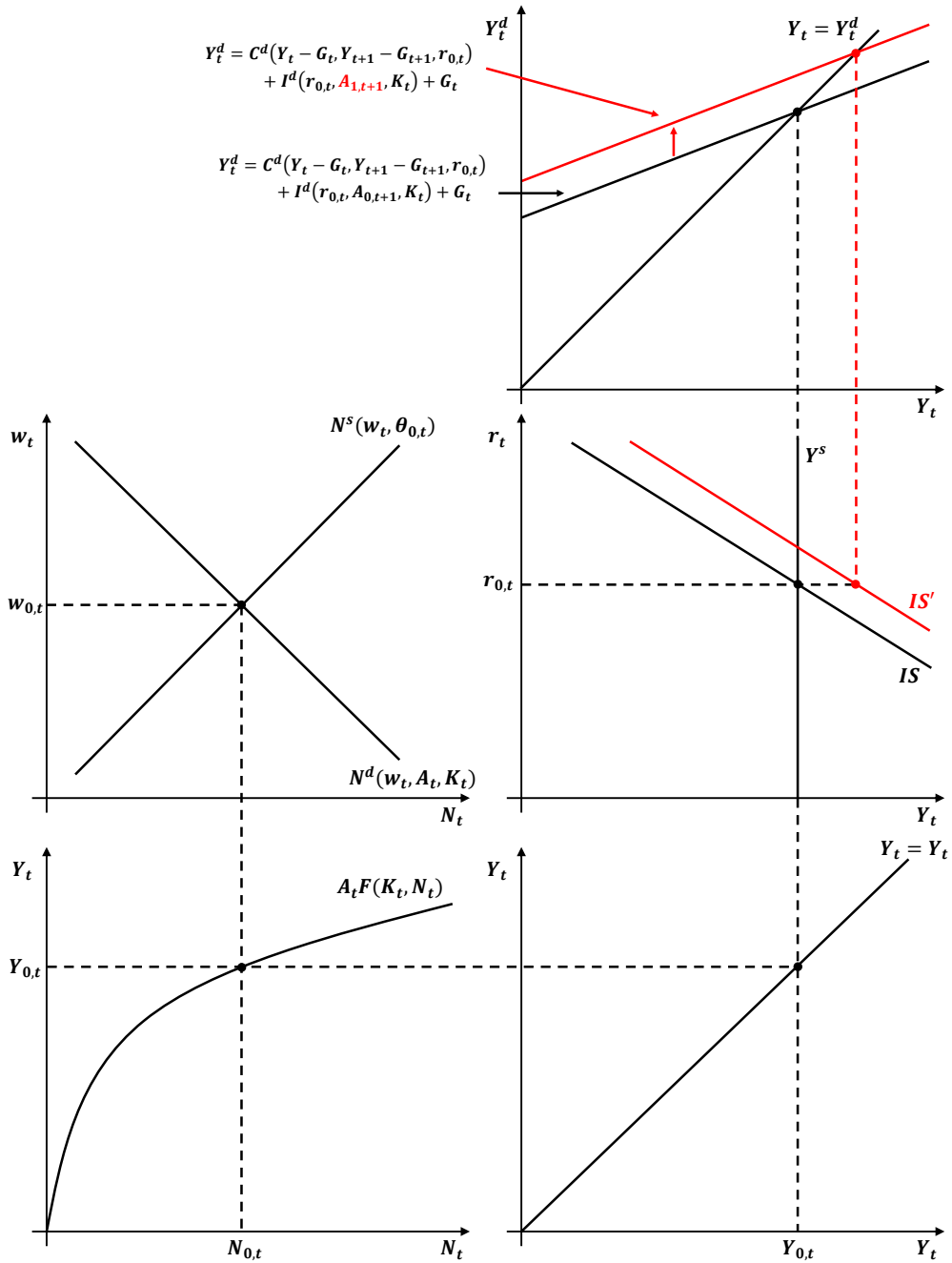

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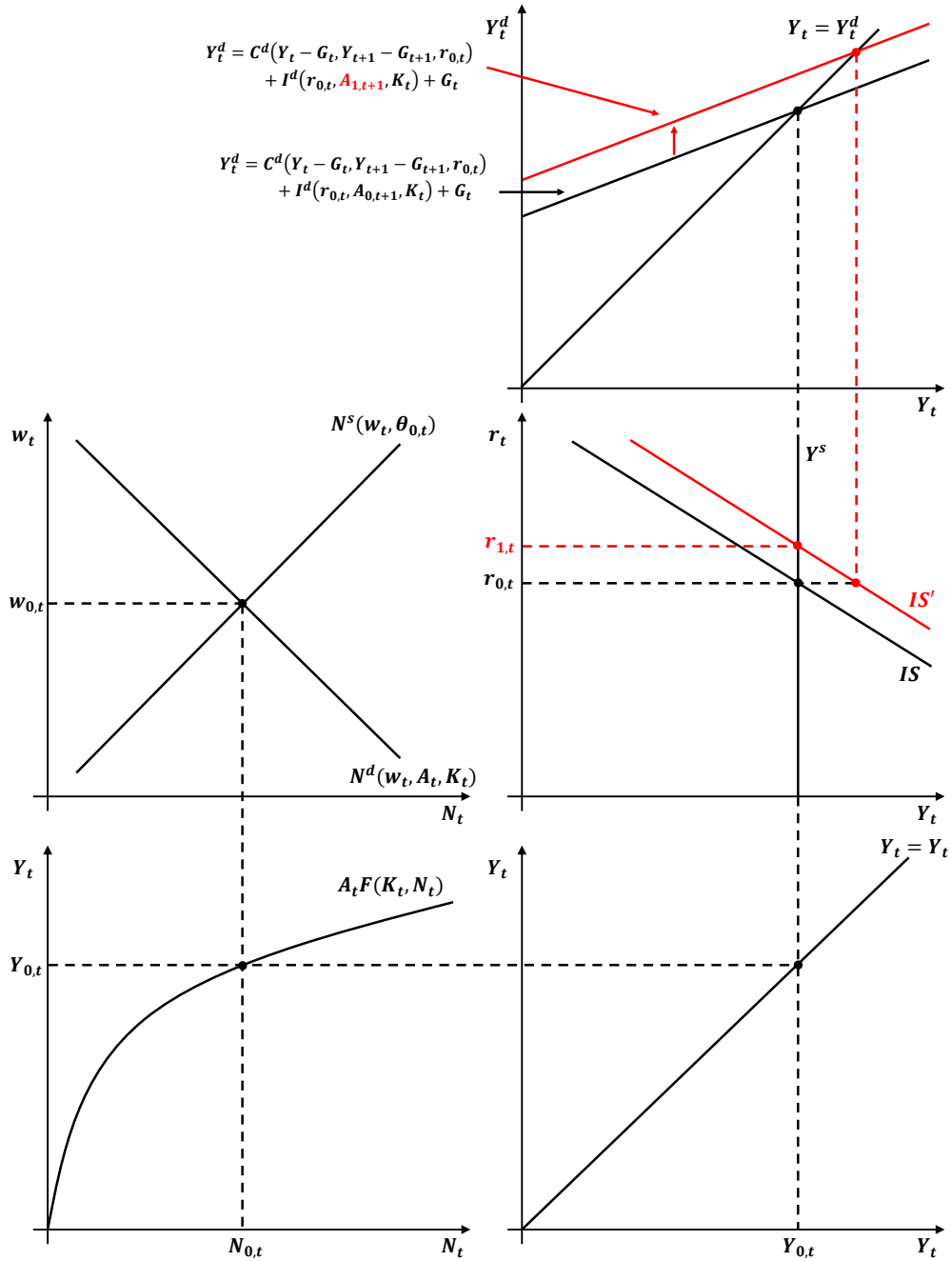

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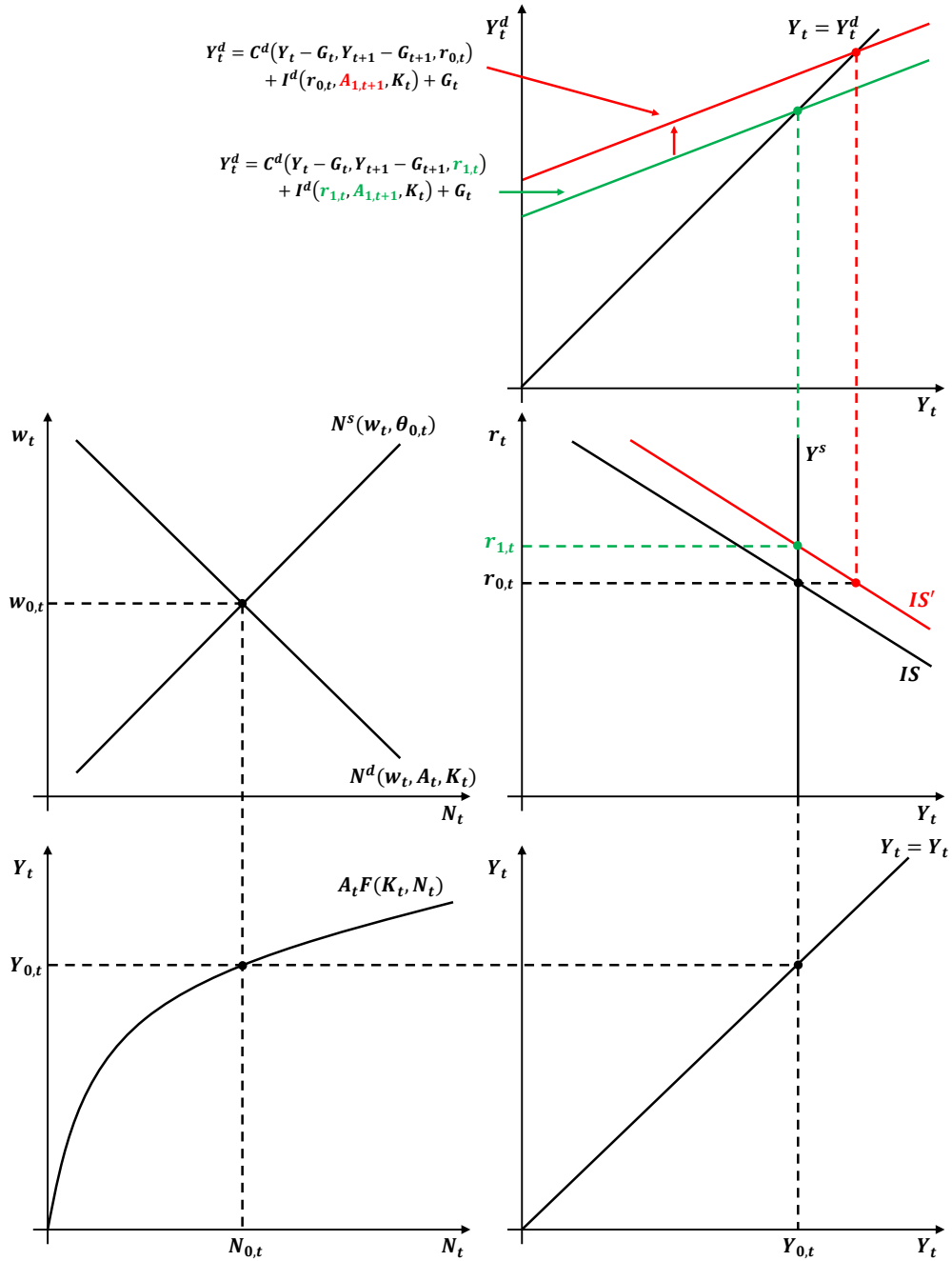
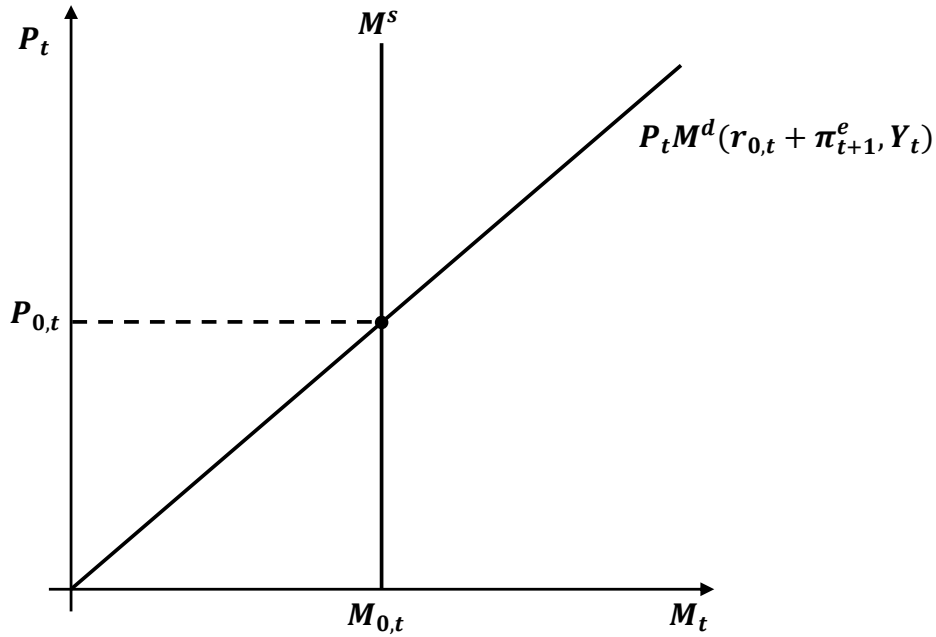


# 5. Demand Shock: $A_{t+1} \uparrow$

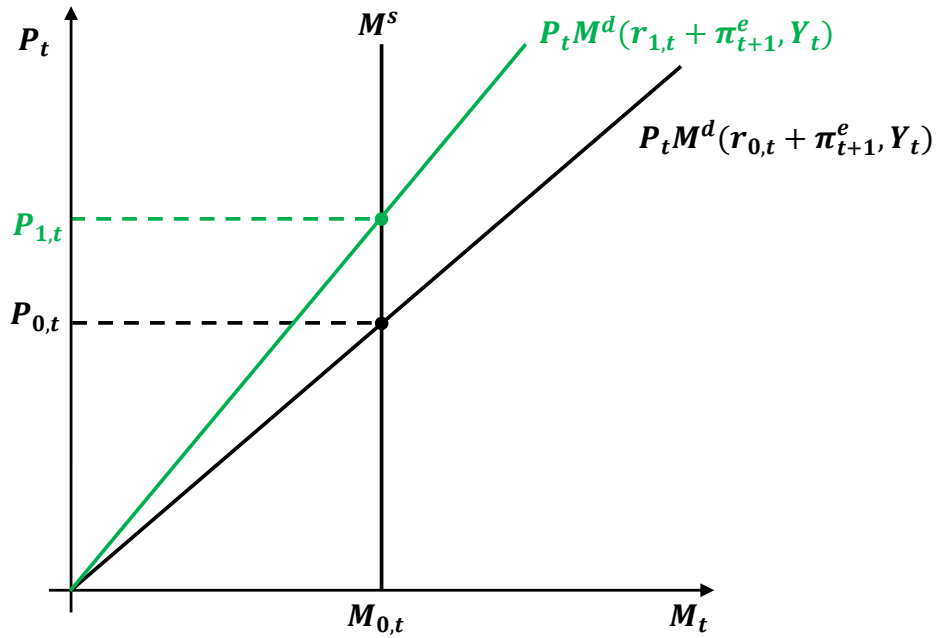
**Anticipated increase in future productivity:**

- Affects current autonomous expenditures through investment $\Rightarrow$ expenditure line shift up (for given $r_t$) $\Rightarrow$ IS curve shifts right
- Supply side remains unaffected $\Rightarrow$ $Y^s$ stays the same
- $r_t$ has to rise $\Rightarrow$ autonomous expenditures decrease $\Rightarrow$ expenditure line shifts back to initial position
- In Equilibrium: no change in $Y_t^d$ or $Y_t$ but $C_t \downarrow$ and $I_t \uparrow$

## Money market



**Money market**



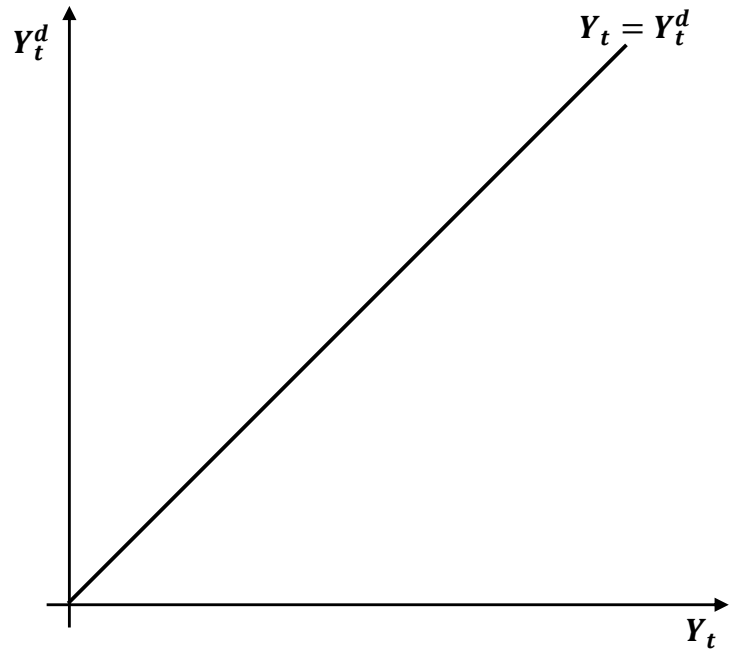

- No change in $Y_t$ but higher $r_t \Rightarrow$ money demand curve becomes steeper
- $P_t$ increases

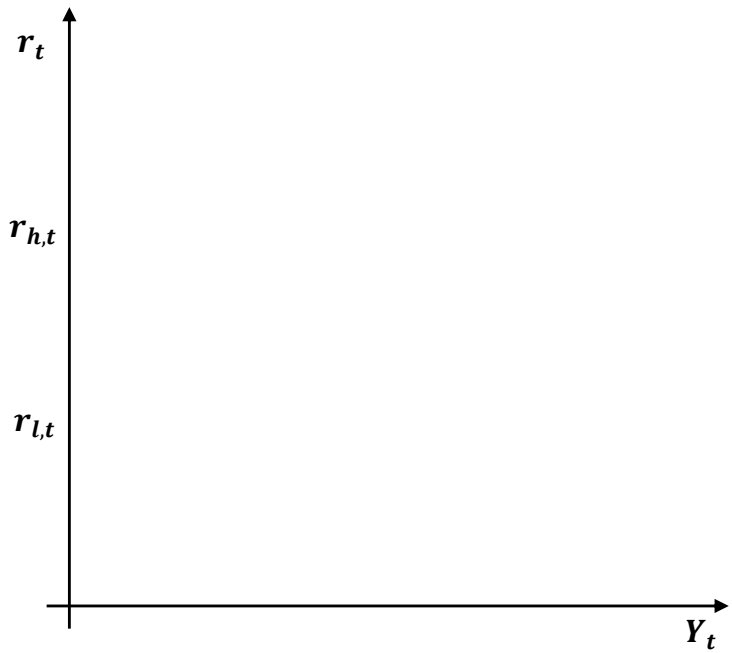
**Question:**
Consider two different versions of the basic neoclassical model. In one, the marginal propensity to consume (MPC) is relatively large, in the other the MPC is relatively small.

a) Show how a higher or lower value of the MPC affects the slope of the IS curve.

b) Suppose that there is an increase in $A_{t+1}$. Show graphically how this impacts equilibrium $r_t$ in the two cases considered in this problem - one in which the MPC is relatively large, and one in which the MPC is relatively small.

# 6. Effect of the MPC



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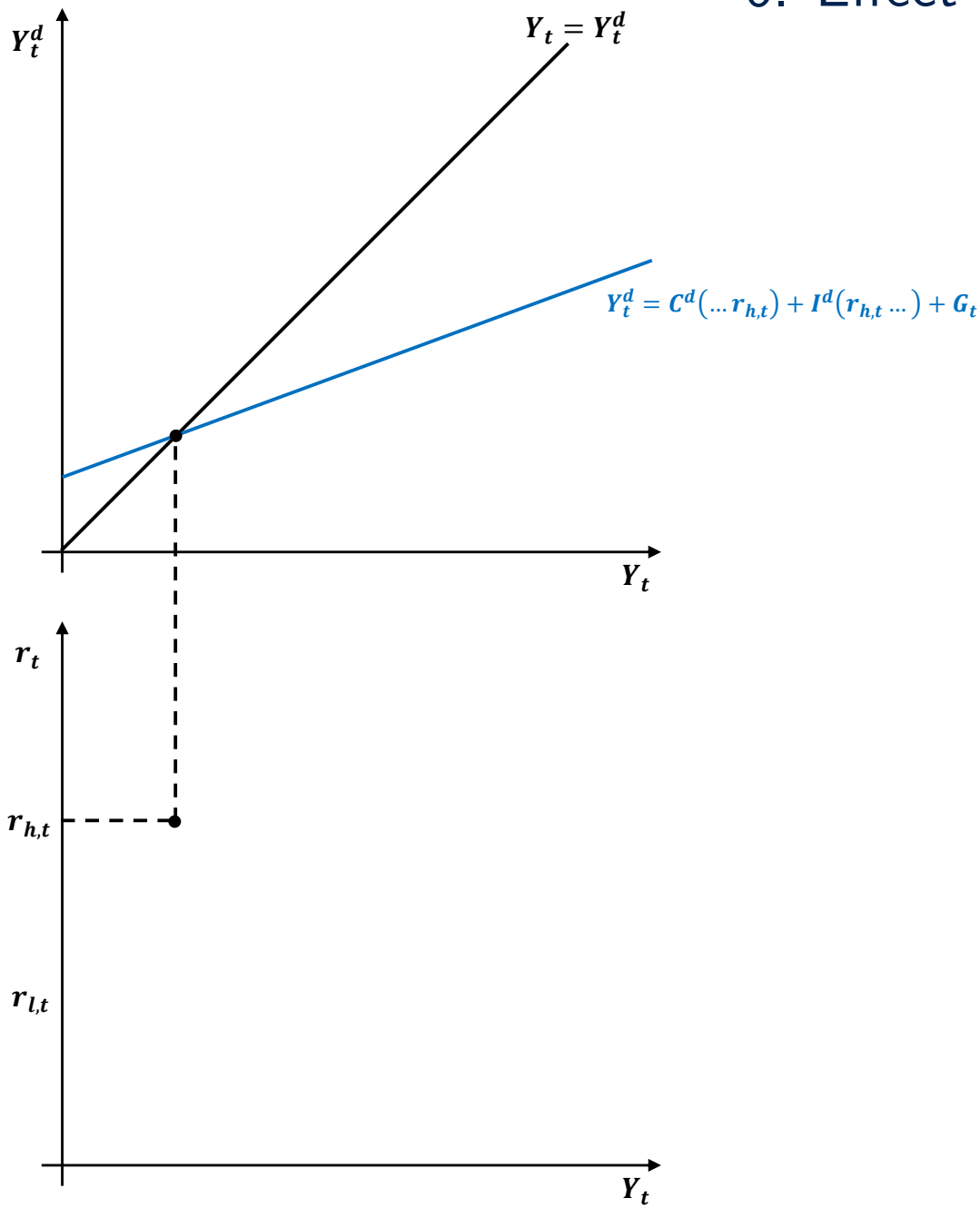

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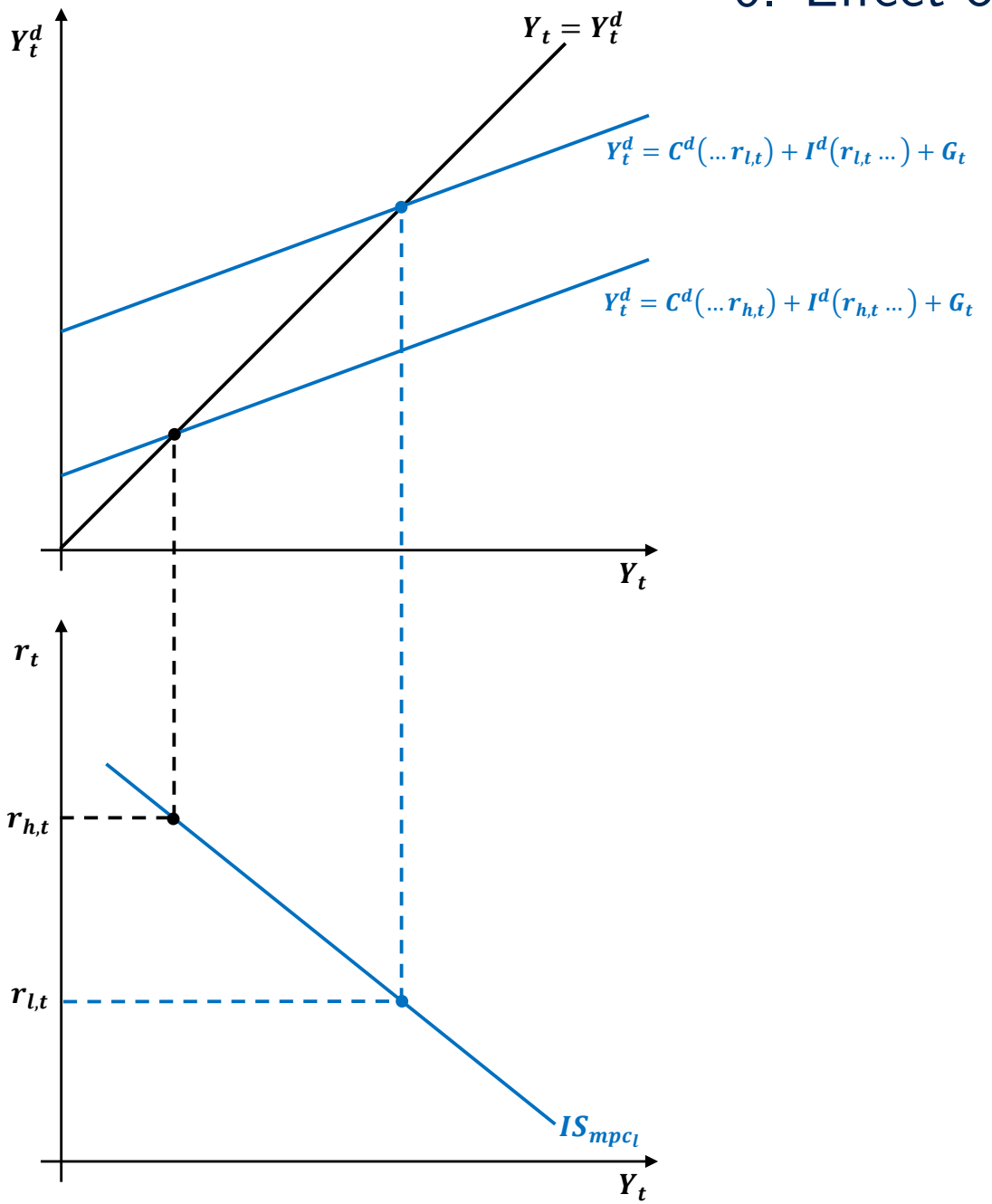

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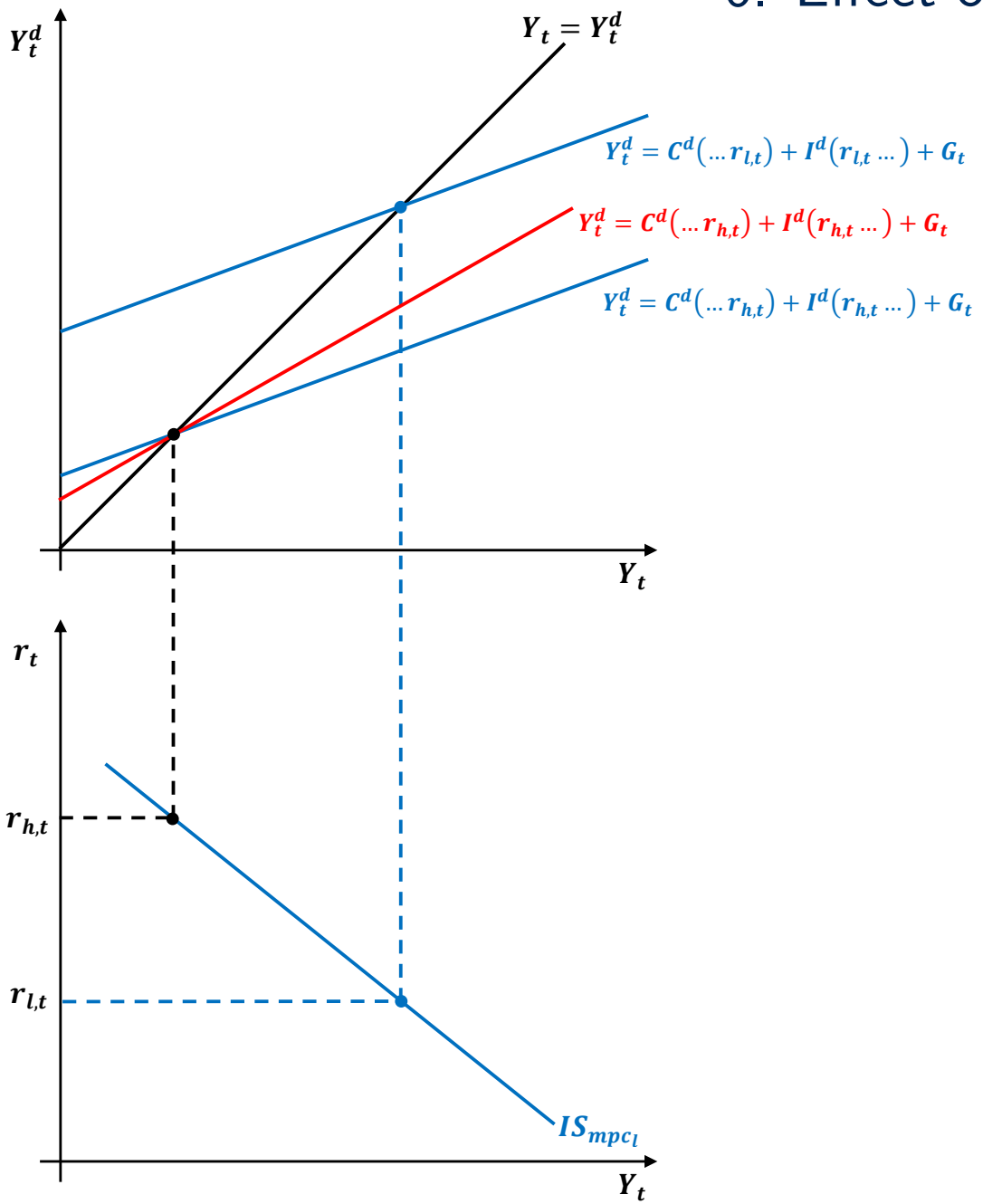

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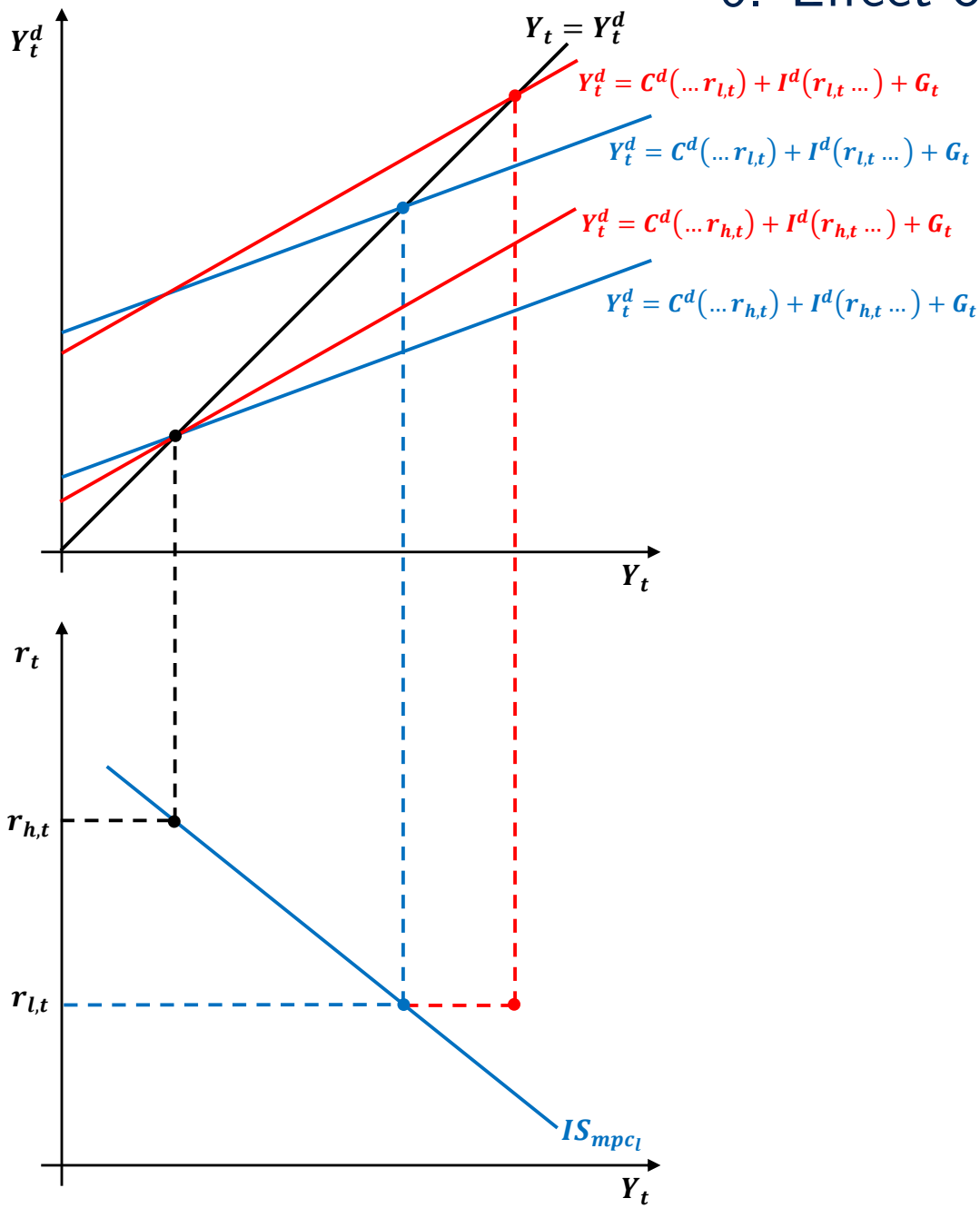

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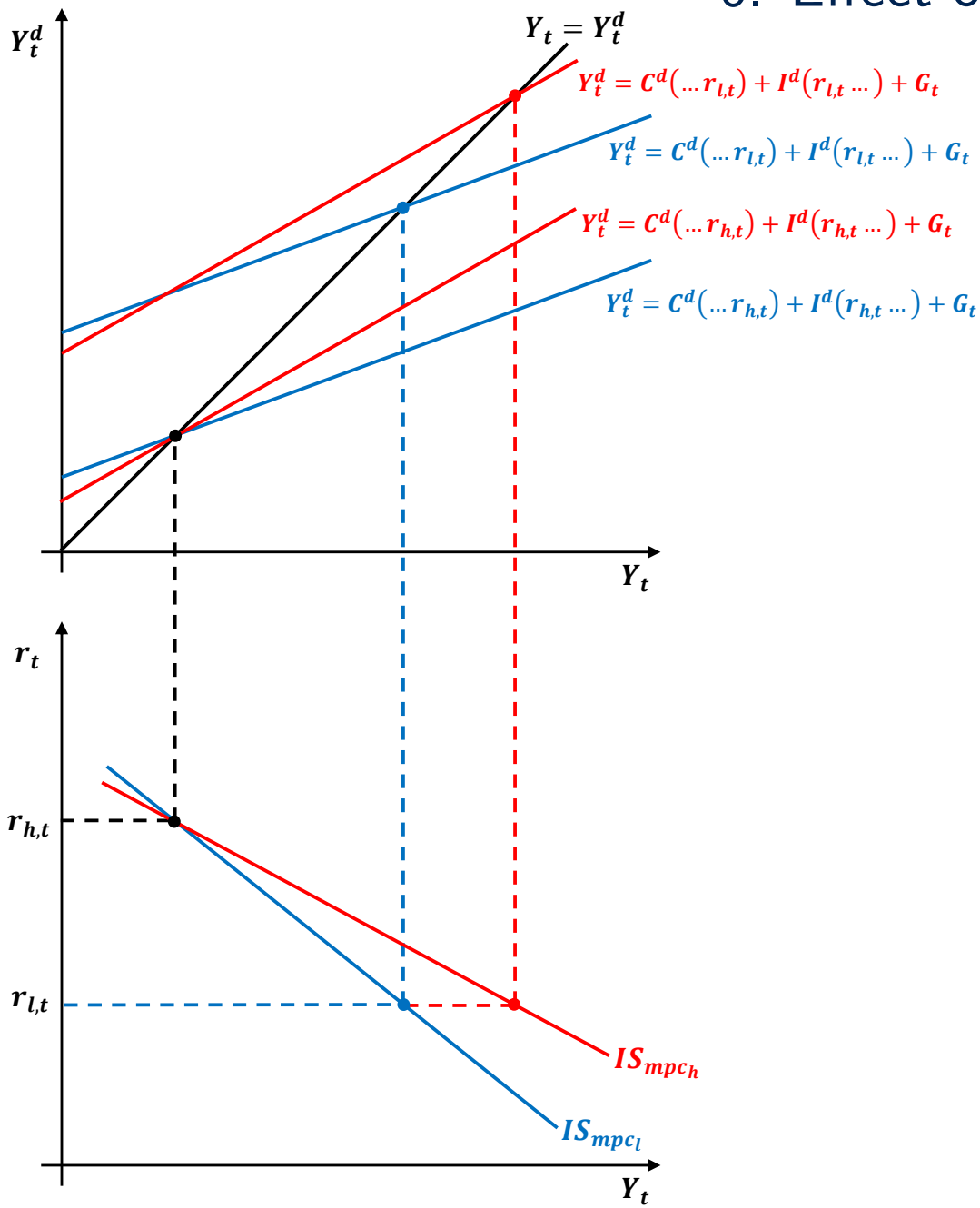

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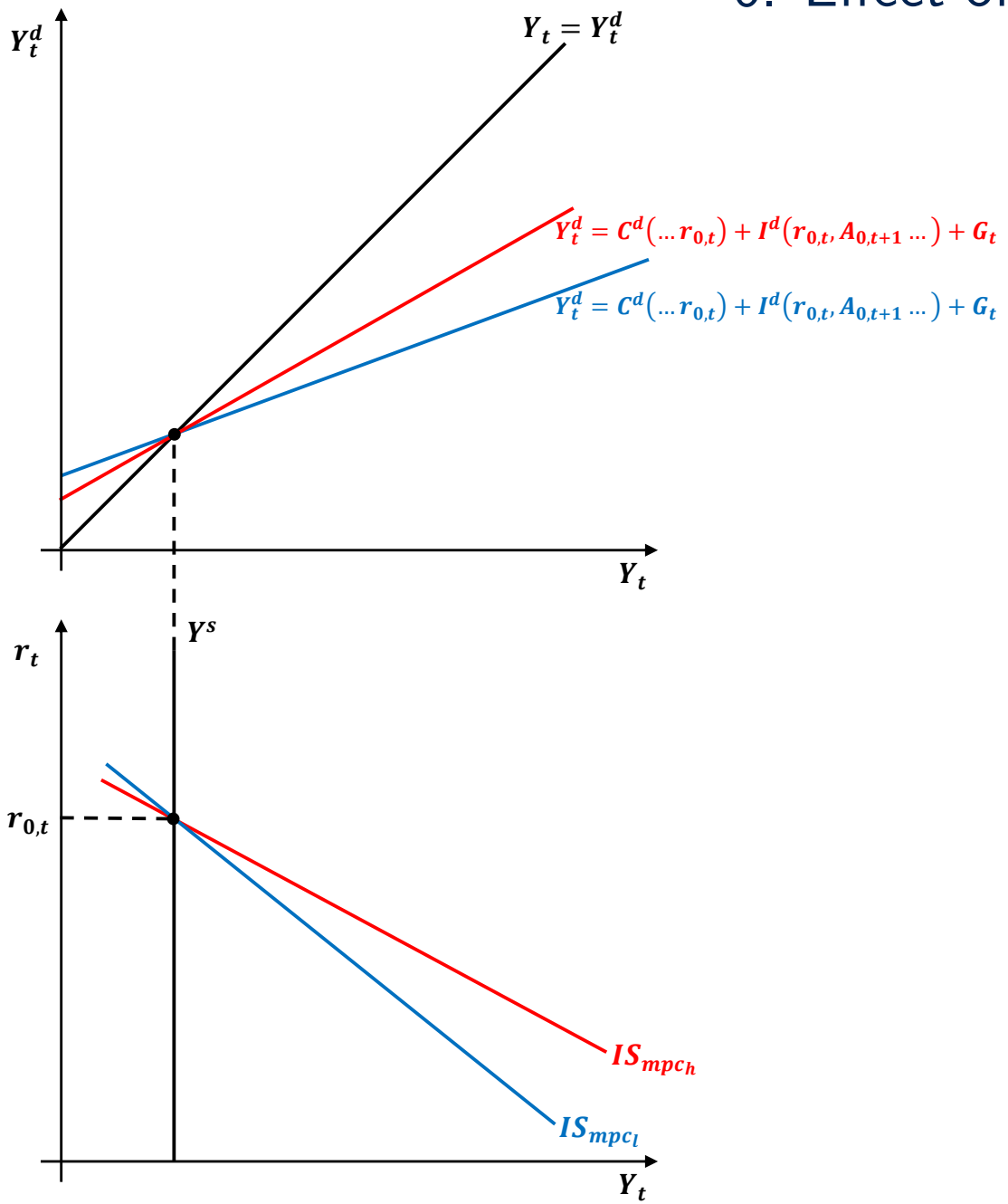

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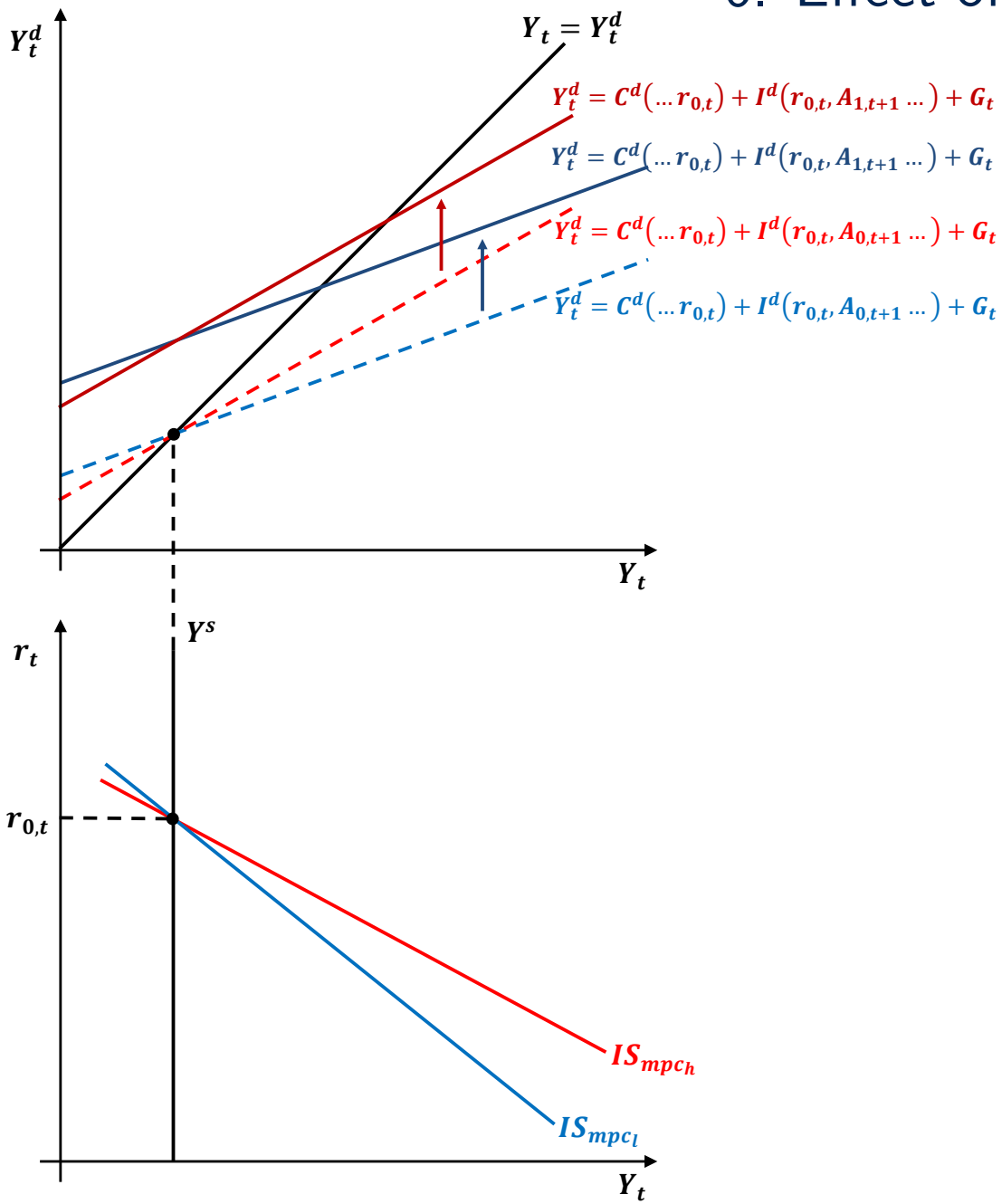

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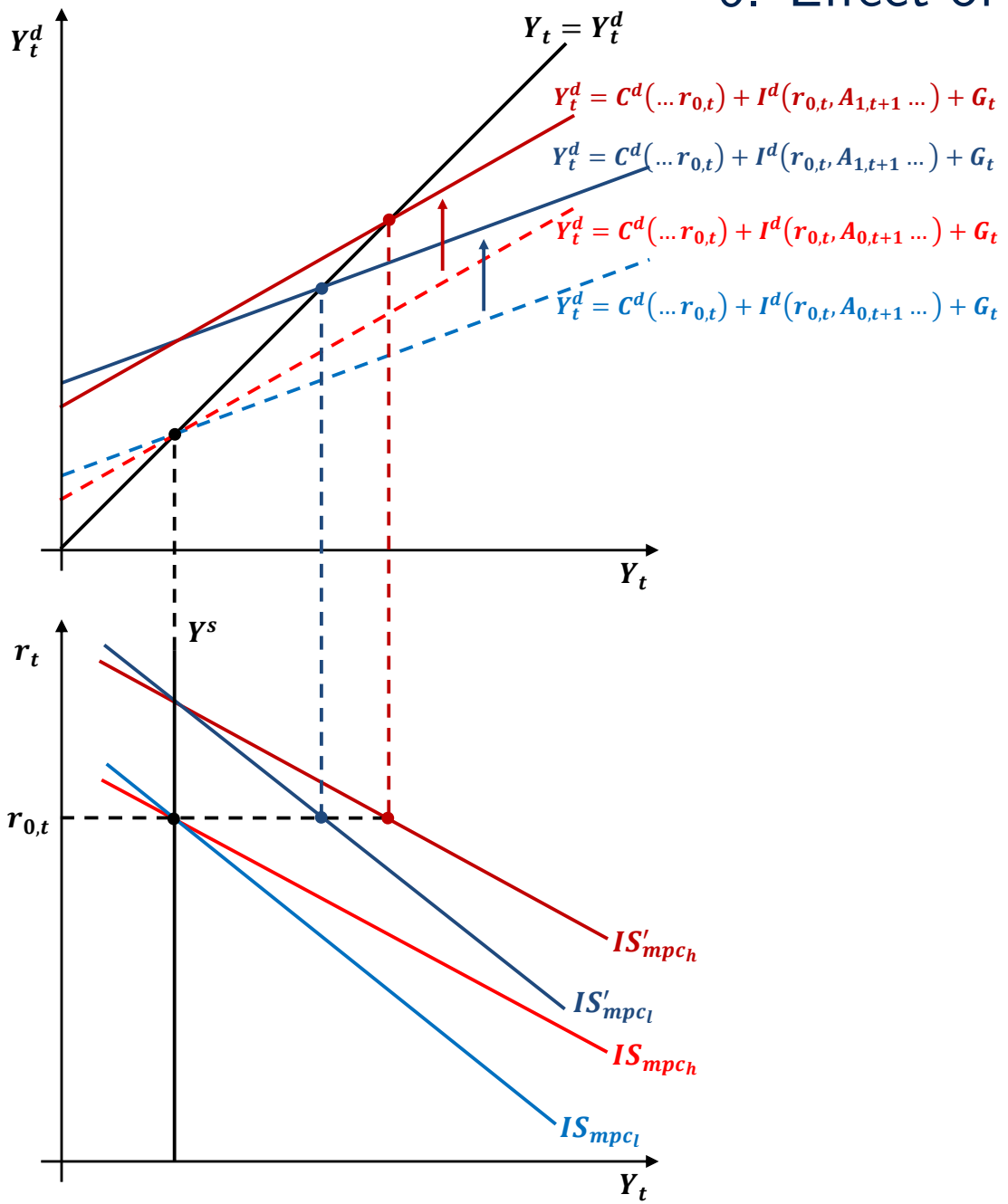
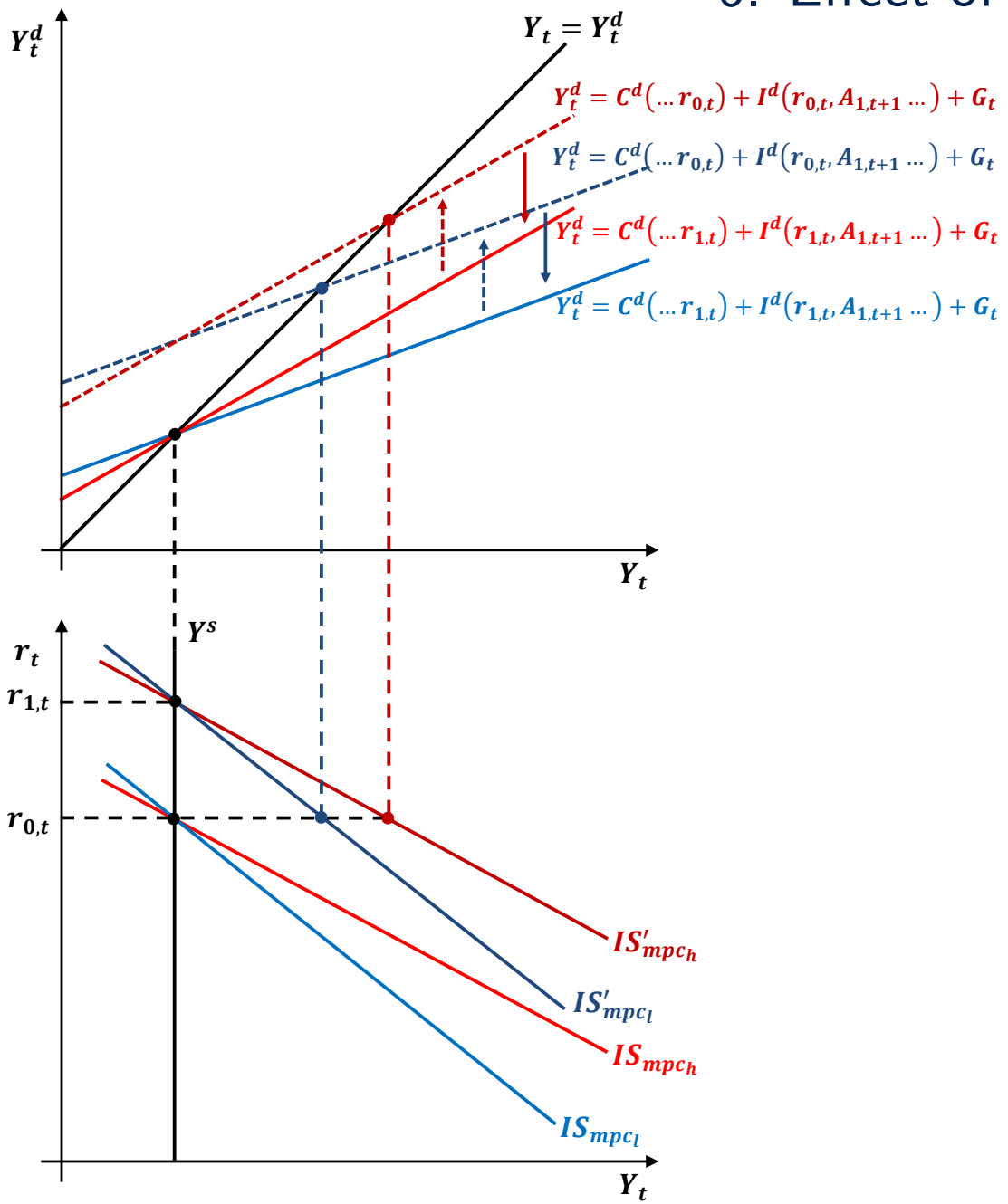
# 6. Effect of the MPC