Econ 702

Macroeconomics I

Charles Engel and Menzie Chinn

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Lecture 10: “Shocks” in the Neoclassical Model

Full Model

$$C_t = C^d(Y_t - G_t, Y_{t+1} - G_{t+1}, r_t)$$

$$N_t = N^s(w_t, \theta_t)$$

$$N_t = N^d(w_t, A_t, K_t)$$

$$I_t = I^d(r_t, A_{t+1}, K_t)$$

$$Y_t = A_t F(K_t, N_t)$$

$$Y_t = C_t + I_t + G_t$$

$$M_t = P_t M^d(r_t + \pi^e_{t+1}, Y_t)$$

$$r_t = i_t - \pi^e_{t+1}$$

Endogenous: $C_t, I_t, Y_t, N_t, r_t, w_t, P_t, i_t$

Exogenous: $A_t, A_{t+1}, G_t, G_{t+1}, \theta_t, M_t, \pi^e_{t+1}$

We will look at effects of shocks to A_t, A_{t+1}, G_t, M_t and π^e_{t+1}. We'll leave shocks to G_{t+1} and θ_t for homework.

We will find that only shocks to A_t (and θ_t) influence Y_t. In the neoclassical model, output is determined entirely by the productive capacity of firms, and the supply of labor.

A_{t+1} influences output in period $t+1$ (that is, Y_{t+1}.)

Variables that influence demand in this model, G_t, M_t and π^e_{t+1}, do not influence Y_t.

All these exogenous variables affect the price level, P_t.

Medium-Run Versus Short-Run Models

In the medium run, P_t adjusts fully to shocks to demand coming from shocks to G_t, M_t and π^e_{t+1}. Y_t is not affected by changes in demand because it is determined entirely on the supply side.

In the short run, in the simplest version of the model, P_t does not adjust at all to shocks to any exogenous variable. Changes in G_t, M_t and π^e_{t+1} affect output, Y_t, instead of prices in the short run.

If there is some adjustment of prices, but not full adjustment of prices, then changes in all of the exogenous variables affect P_t and Y_t.

Future Output

You may have noticed that there is one variables, Y_{t+1}, that we have not listed as either exogenous or endogenous.

We will assume that the only exogenous variable in our list that Y_{t+1} responds to is A_{t+1}. We assume it responds exactly as Y_t responds to A_t.

That may seem odd. Most of our shocks have an effect on I_t. And if I_t changes, then so will K_{t+1}. But we assume that in the medium run, the amount of new net investment is so small that it barely changes K_{t+1} and therefore has a negligible effect on Y_{t+1}.

Effects of Changes in Productivity

When A_t rises, there is a direct effect on output: $Y_t = A_t F(K_t, N_t)$.

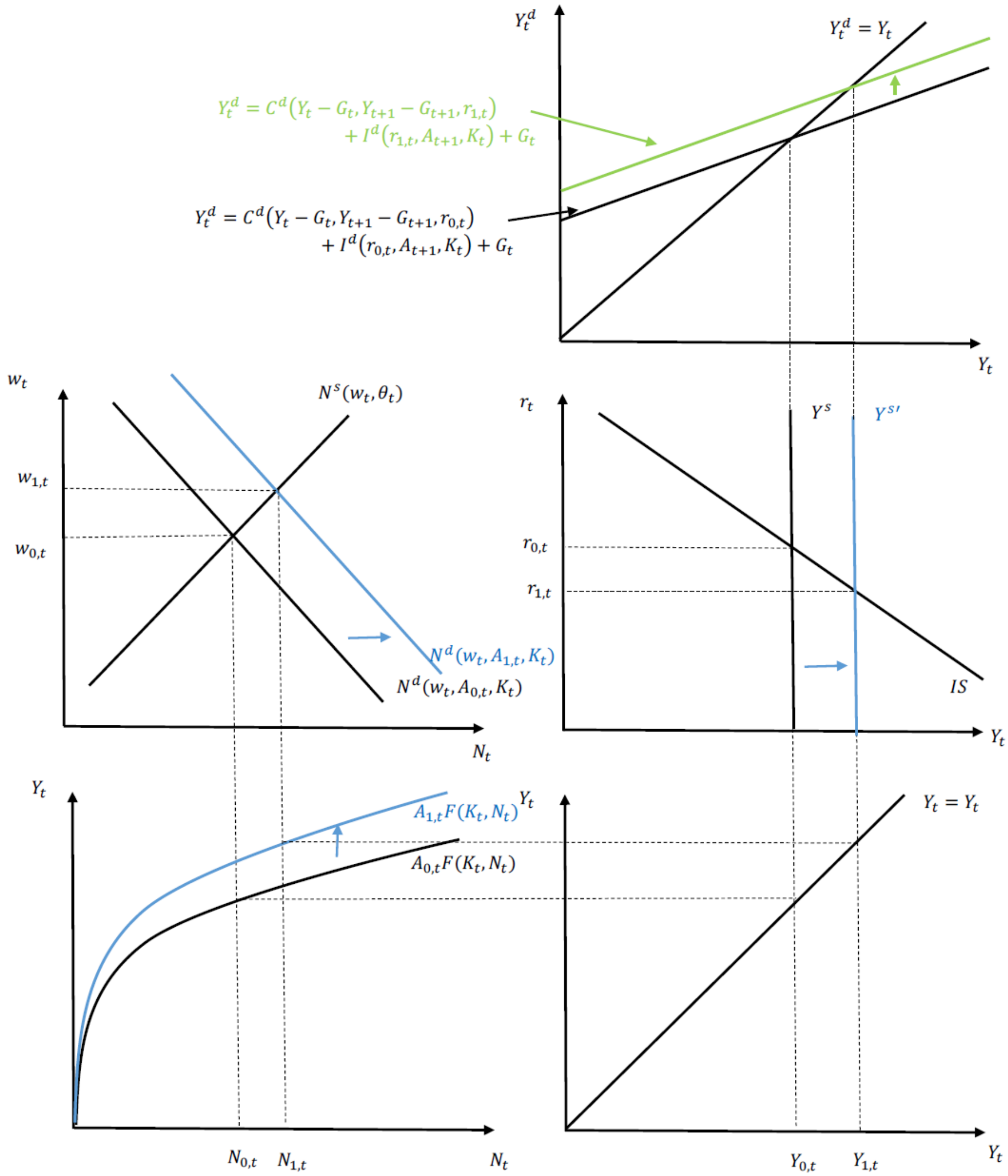
Also, labor demand rises because MPL rises: $MPL_t = A_t F_N(K_t, N_t)$.

Output rises because of both effects.

Y_t is determined by the supply side. $C_t + I_t + G_t = Y_t$ in equilibrium, so $C_t + I_t$ must rise (G_t is exogenous.)

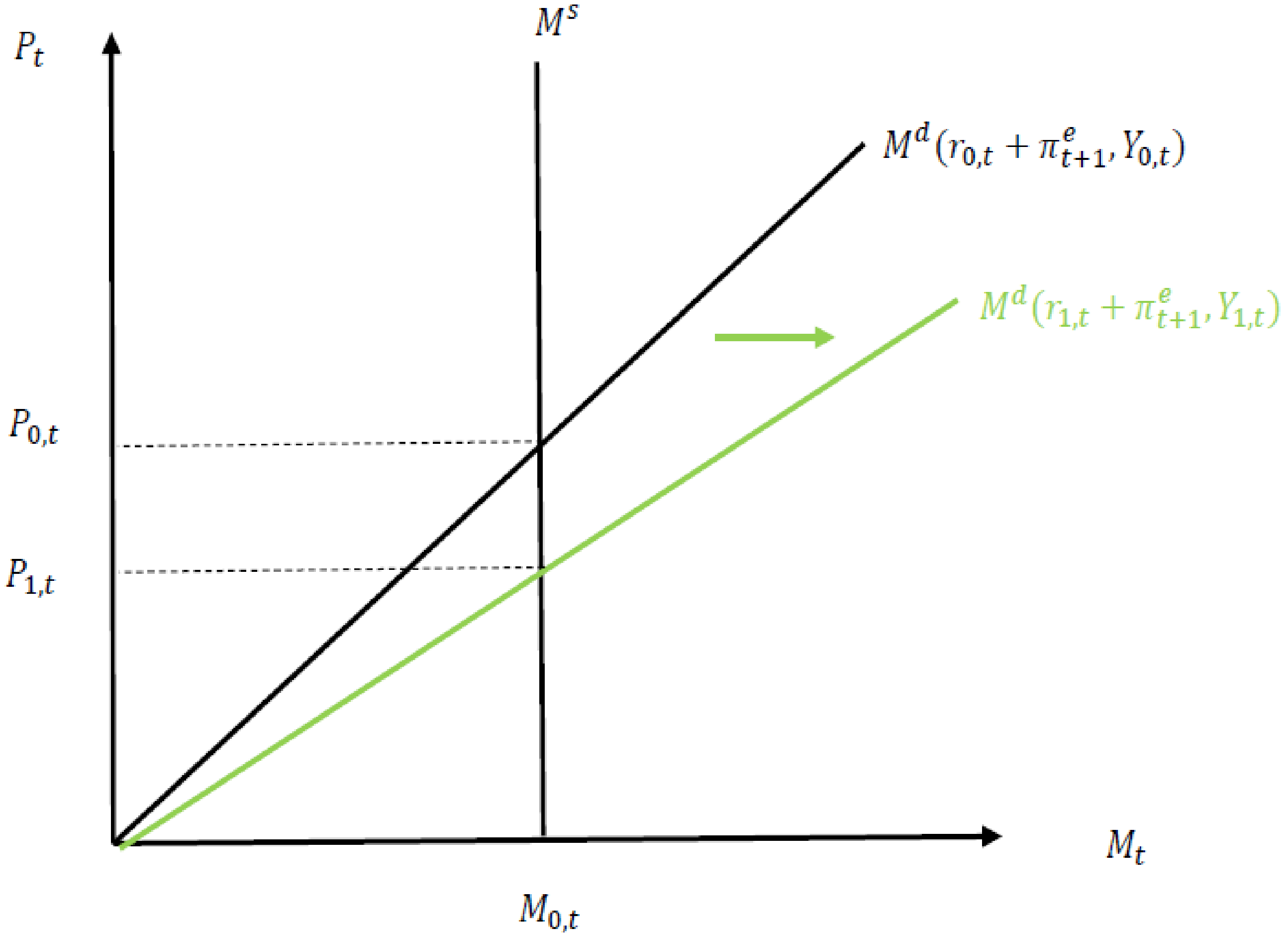
What makes $C_t + I_t$ rise? A drop in the real interest rate, r_t.

Figure 18.3: Increase in A_t



What Happens to Nominal Price Level?

Figure 18.4: Increase in A_t: The Money Market



Increase in Future Productivity

An increase in A_{t+1} does not change current output, but it does increase Y_{t+1}.

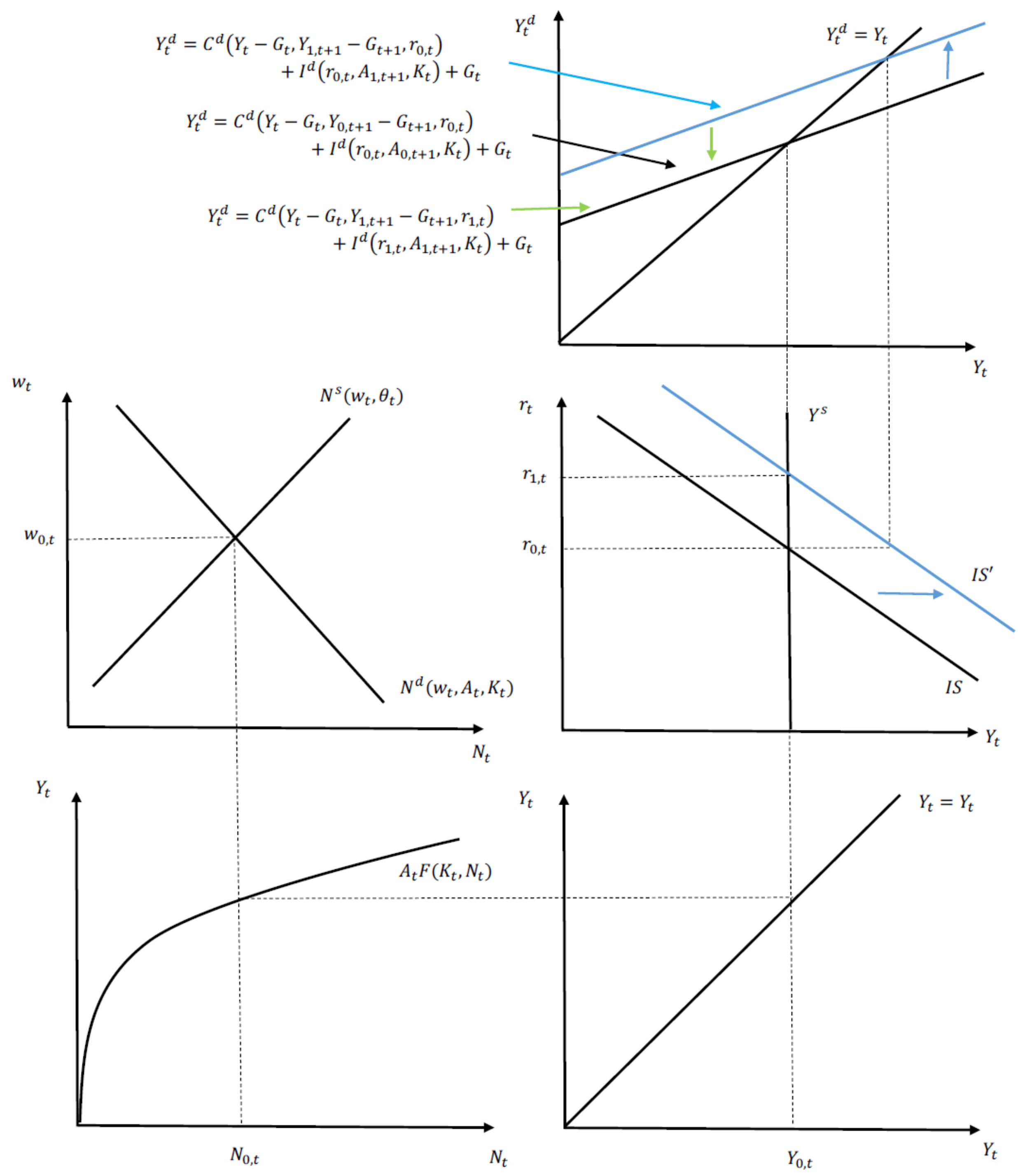
Because Y_{t+1} goes up, current consumption, C_t, rises.

Also, investment in period t depends on the MPK in period $t+1$, which rises when A_{t+1} goes up: $MPK_{t+1} = A_{t+1}F_K\left(K_{t+1}, N_{t+1}\right)$.

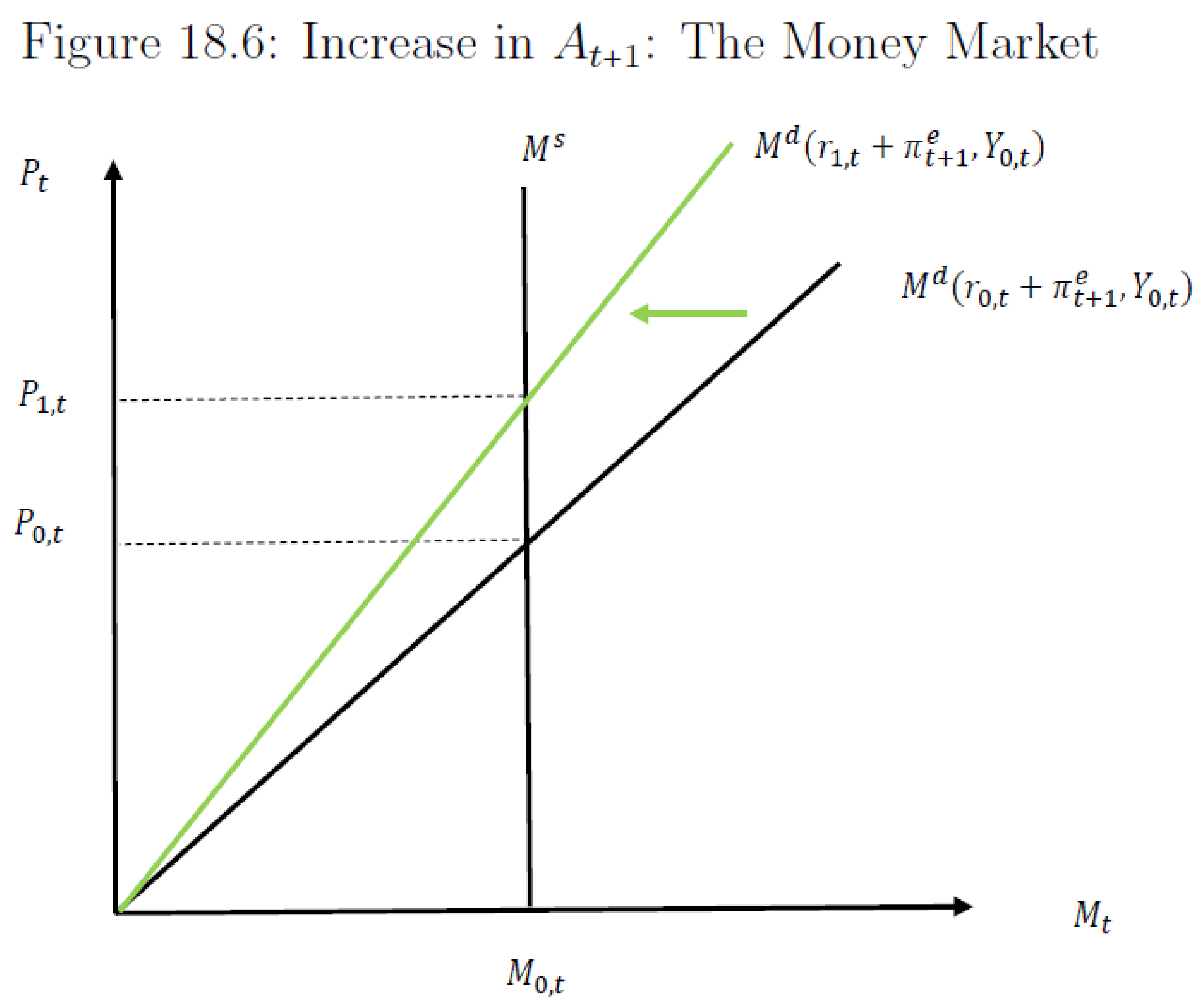
The direct effect on an increase in A_{t+1} is to make C_t and I_t increase. But since $C_t + I_t + G_t = Y_t$ something must change to bring $C_t + I_t$ back down. What is it? An increase in r_t.

In the end, $C_t + I_t$ is unchanged, but we cannot say whether C_t and I_t individually go up or down.

Figure 18.5: Increase in A_{t+1}



How do Prices Change?



Increase in Government Spending

Remember, Y_t does not change.

Consumption, C_t, falls because taxes must be raised either in period t or $t+1$ to pay for the government spending. Recall that from Ricardian equivalence, the present value of after-tax income depends only on how much government spends, not when it taxes:

$$Y_t - G_t + \frac{Y_{t+1} - G_{t+1}}{1+r_t}$$

But C_t falls less than one-for-one with the increase in government spending (the MPC is less than one.)

So the direct effect is that $C_t + G_t$ rises.

But $C_t + I_t + G_t = Y_t$, and Y_t does not change. It must be the case that something works to make $C_t + I_t$ fall to offset the initial increase in $C_t + G_t$.

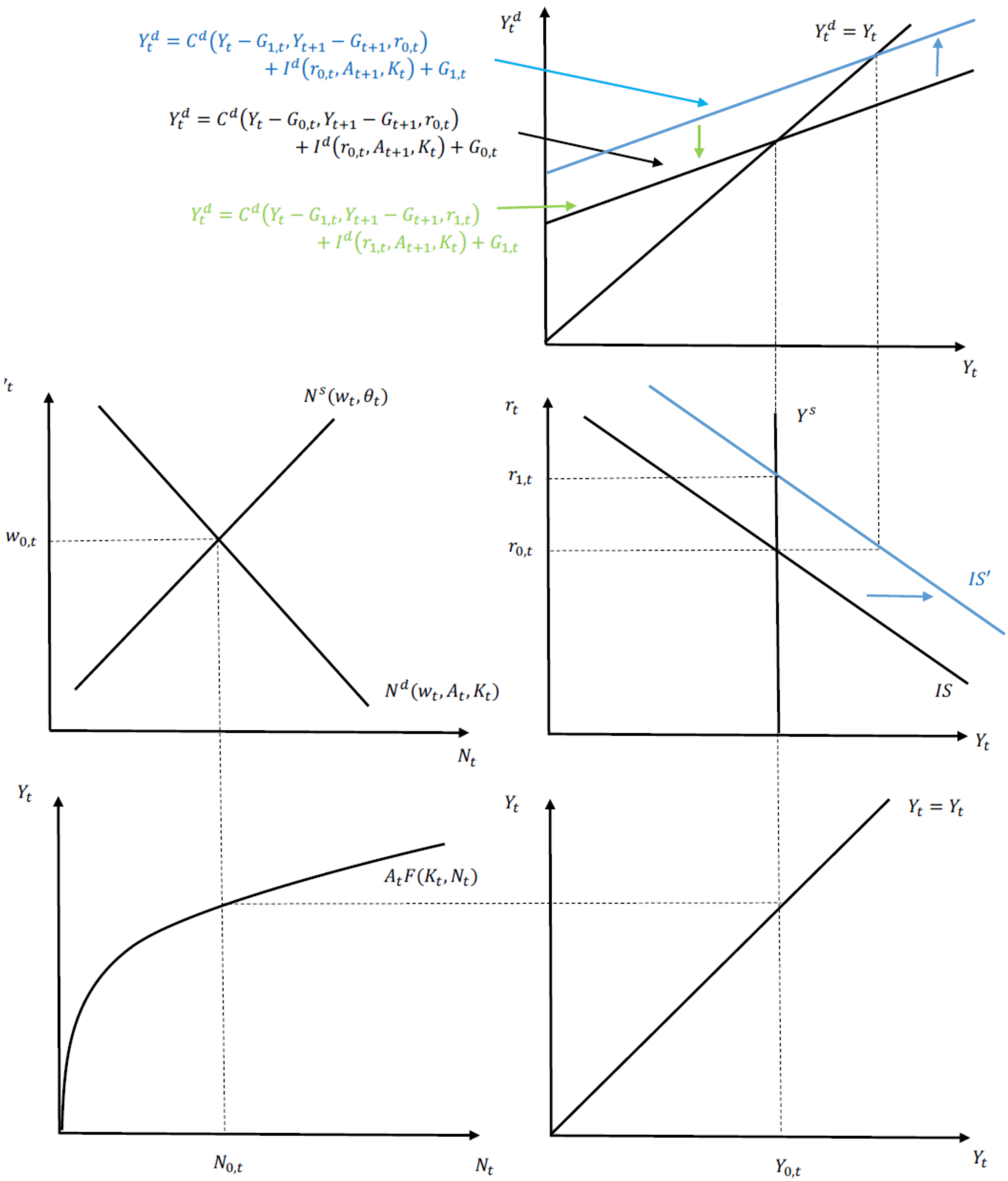
There is an increase in r_t.

Note that in the end, C_t falls because after-tax income falls and because r_t increases. And I_t falls because r_t increases.

The increase in G_t ends up being exactly offset by a drop in $C_t + I_t$ so that $C_t + I_t + G_t$ does not change. We say that the government spending increase "crowds out" consumption and investment spending.

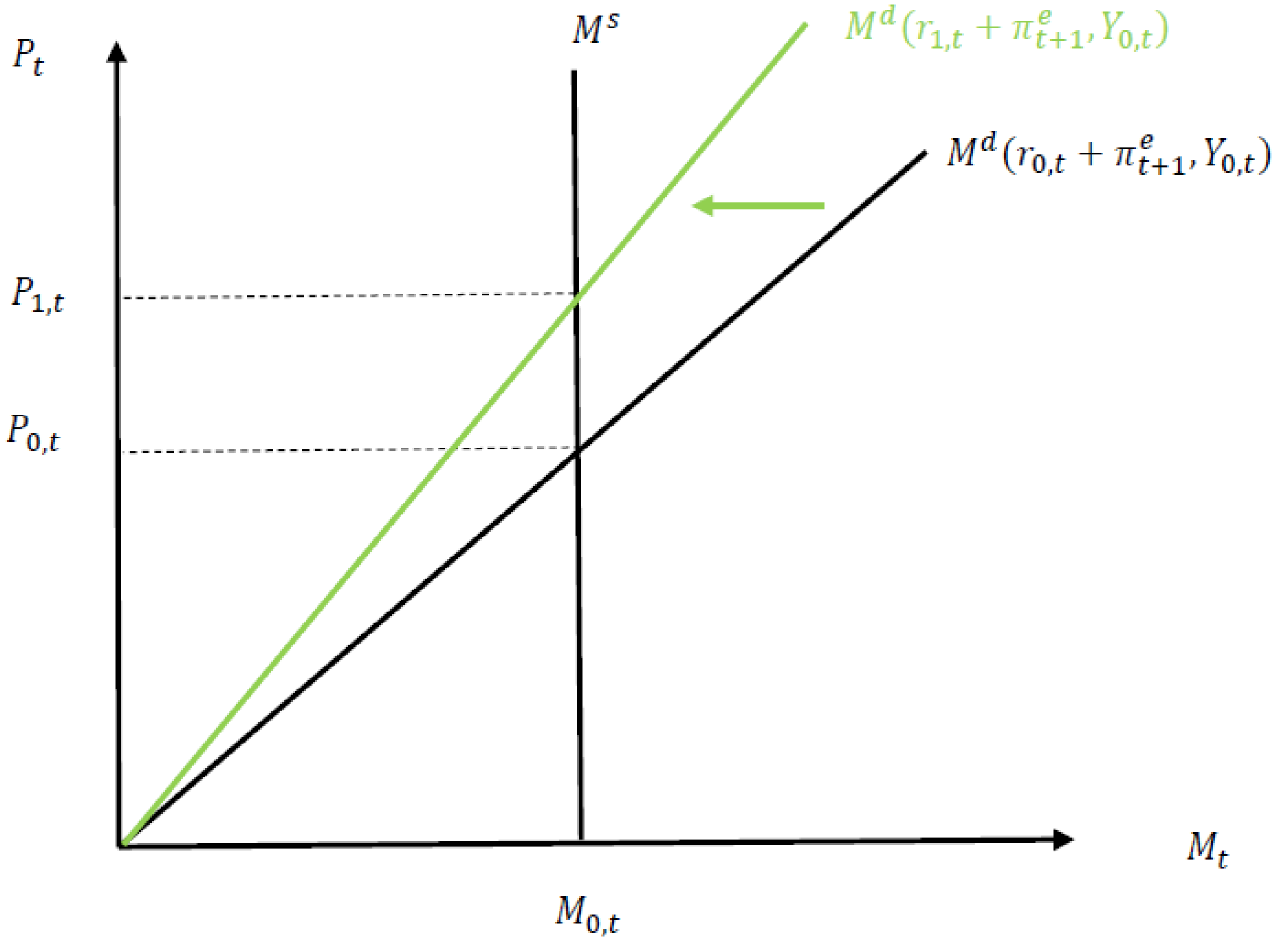
The government spending "multiplier" is zero!

Figure 18.7: Increase in G_t



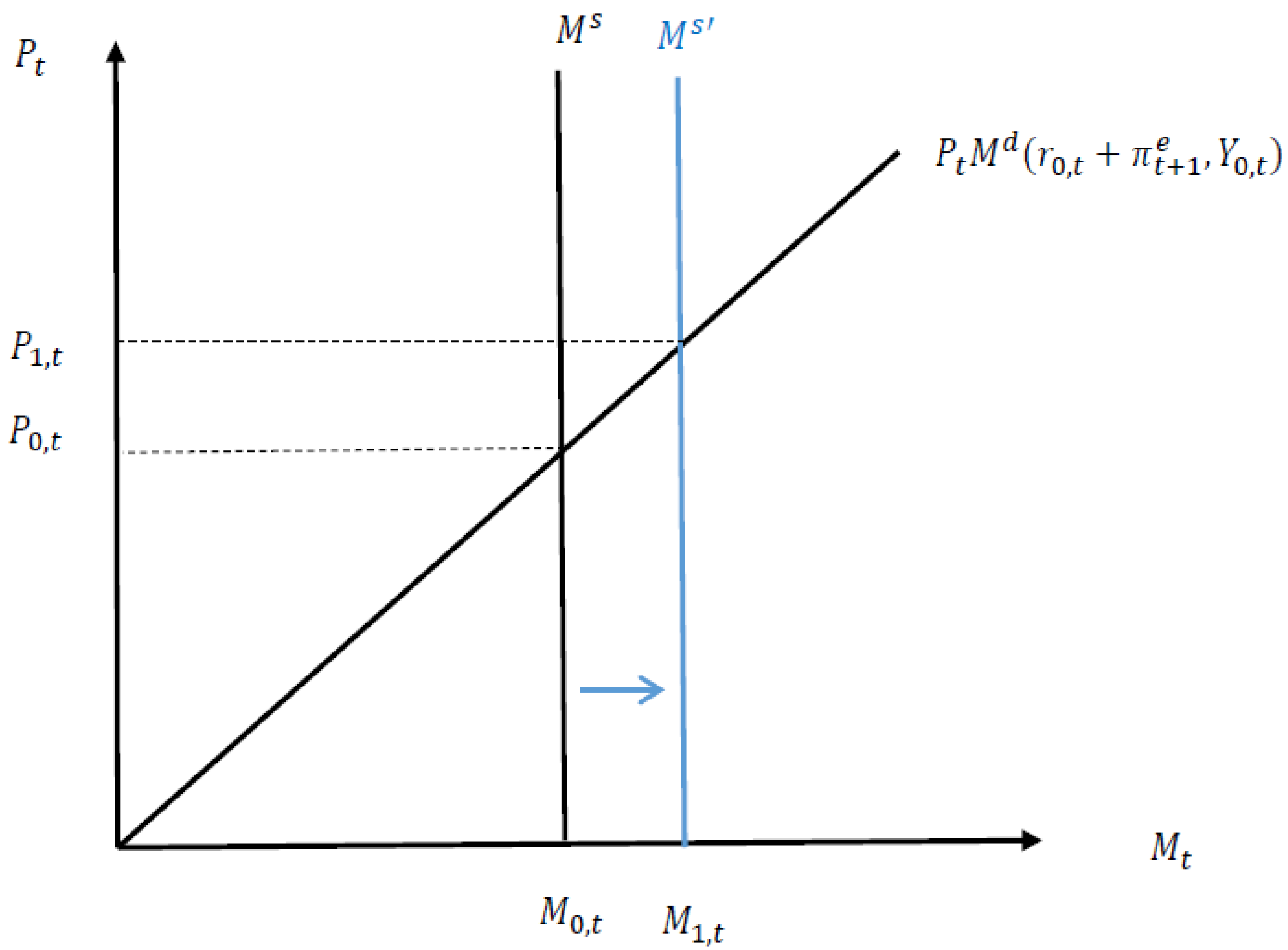
How do Prices Change?

Figure 18.8: Increase in G_t: The Money Market



An Increase in the Money Supply

Figure 18.9: Increase in M_t



An Increase in Inflation Expectations

Figure 18.10: Increase in π^e_{t+1}