Lecture 15: The Neoclassical Model I

ECON 30020: Intermediate Macroeconomics

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Spring 2026

Readings

GLS Ch. 18 and 19

Neoclassical Model

The optimizing, equilibrium model of the economy with which we have been working is sometimes called the "neoclassical model" or "real business cycle" model

The model features optimizing agents and frictionless markets

It emphasizes supply shocks (changes in A_t or θ_t) as the principal drivers of fluctuations in endogenous variables

Money is neutral: changes in money have no impact on real variables

In fact, there is no role for any type of stabilization policy at all

Model might be a useful description of the "medium run" – frequencies of time between a couple of years and a decade

Equilibrium Conditions

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

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

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

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

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

$$Y_t = C_t + I_t + G_t$$

$$M_t = P_t M^d(i_t, Y_t)$$

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

Eight equations, eight endogenous variables (Y_t, C_t, I_t, N_t, r_t, w_t, P_t, i_t)

Assume Ricardian Equivalence holds (i.e., behave as though $G_t = T_t$)

Classical Dichotomy

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

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

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

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

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

$$Y_t = C_t + I_t + G_t$$

$$M_t = P_t M^d(i_t, Y_t)$$

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

The first six equations (in blue) include six real endogenous variables (Y_t, N_t, C_t, I_t, r_t, w_t

Don't need to know anything about nominal variables to solve for the equilibrium values of real variables

Classical Dichotomy

The neoclassical model features the classical dichotomy:

- The real side of the economy can be determined independently of the nominal side
- Implication: solve for real equilibrium "first," nominal variables "second"
- Does not imply that real variables have no impact on nominal ones

Closely related to monetary neutrality and superneutrality

- Neutrality: changes in the level of money have no impact on real variables
- Superneutrality: changes in the growth rate of money have no impact on real variables

In general, the classical dichotomy implies neutrality, but not superneutrality (though all hold here)

Graphical Analysis

Can summarize the real side with graphical analysis consisting of two main curves:

- The *IS* Curve: summarizes demand (consumption function, investment demand, and resource constraint)
- The Y^s curve: summarizes supply (labor supply, labor demand, and production function)

The Y^s curve will be vertical under certain assumptions: only supply matters

Can solve for P_t and i_t "second" using a money demand-supply graph

IS Curve

Set of (r_t, Y_t) pairs where household and firm behave optimally with respect to consumption and investment and income equals desired expenditure

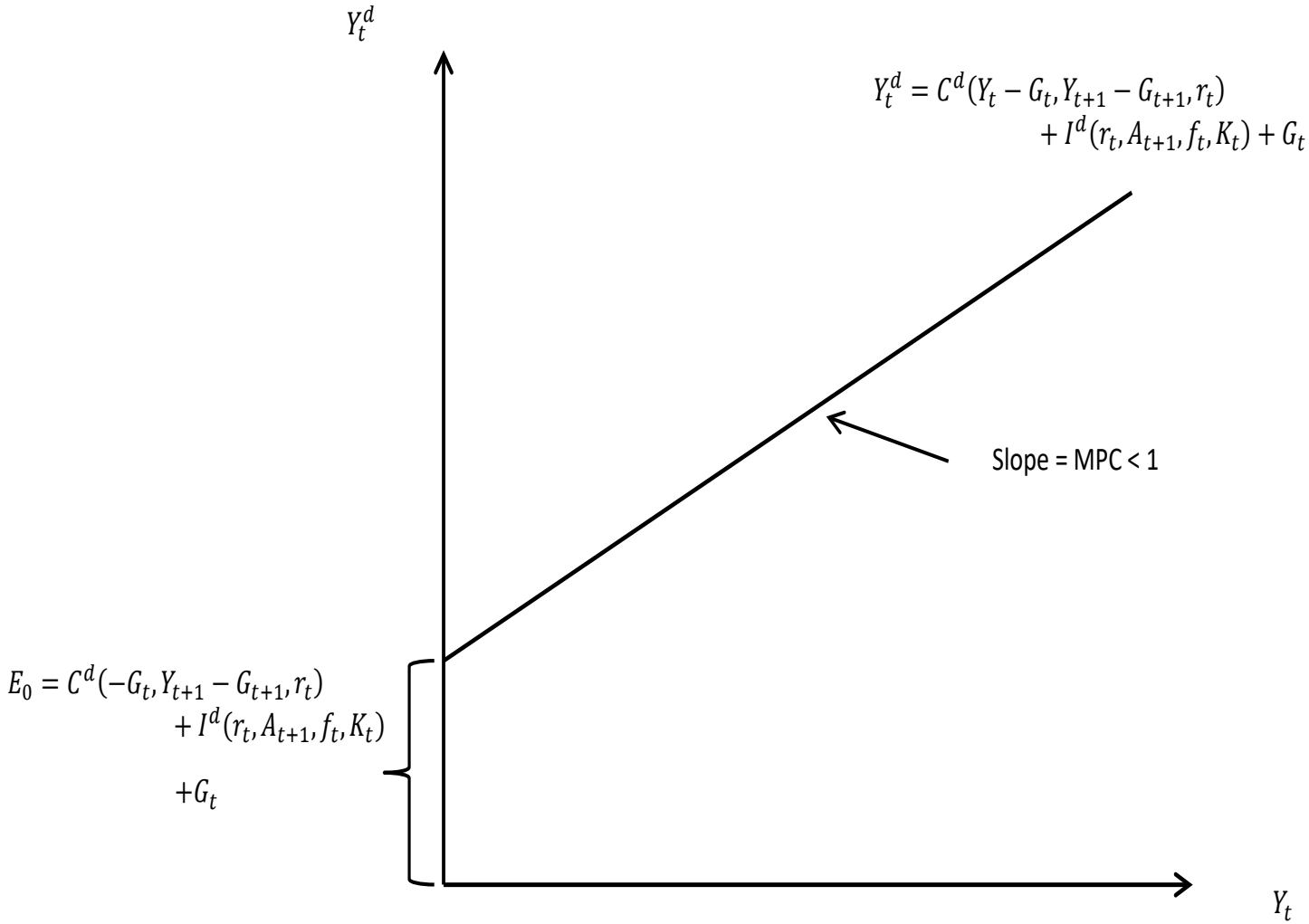
$$Y_t = C^d\left(Y_t - G_t, Y_{t+1} - G_{t+1}, r_t\right) + I^d\left(r_t, A_{t+1}, f_t, K_t\right) + G_t$$

Graphically, start by plotting Y_t^d (desired expenditure) as a function of Y_t

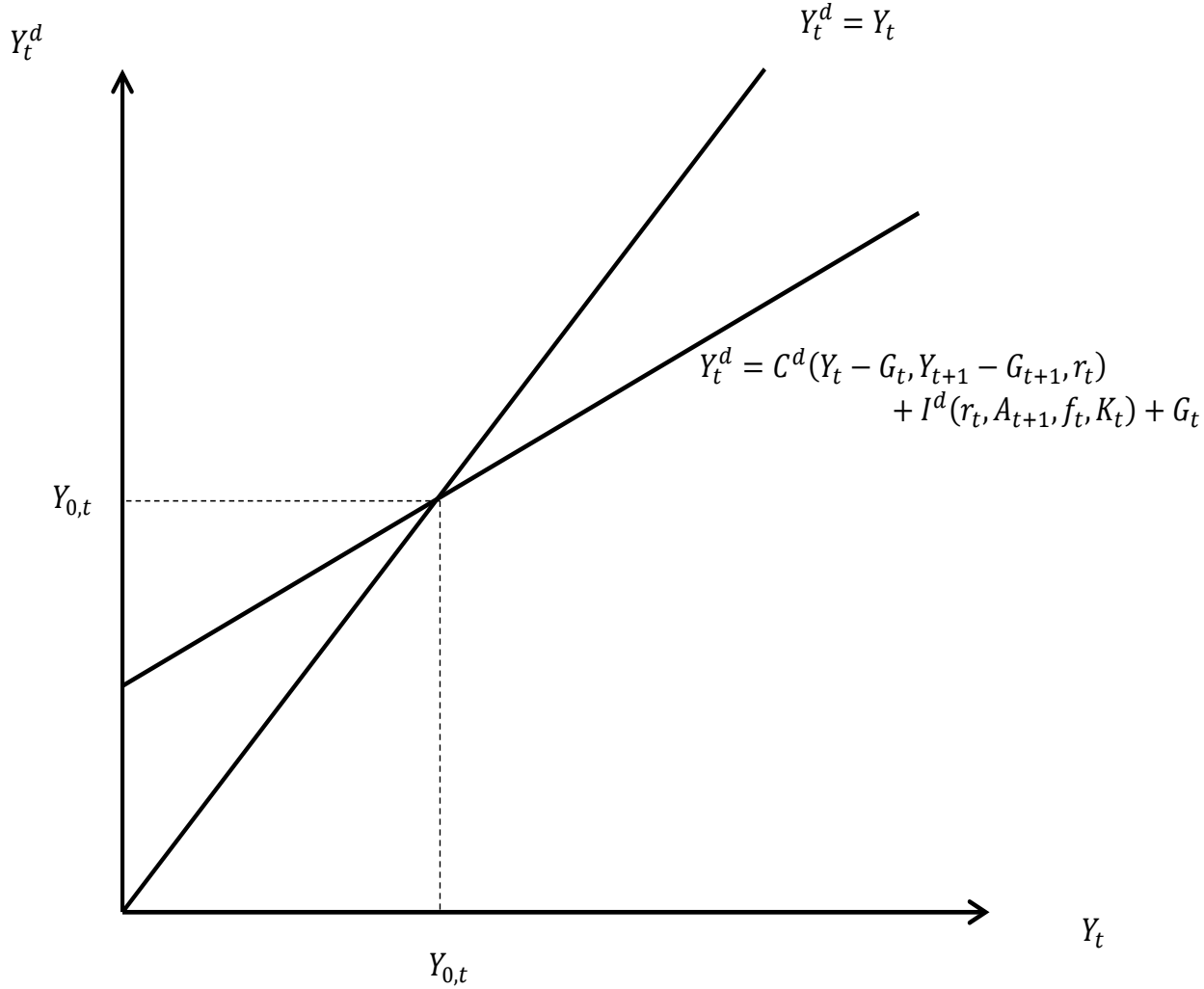
Then find the point where they cross

Repeat for different possible values of r_t

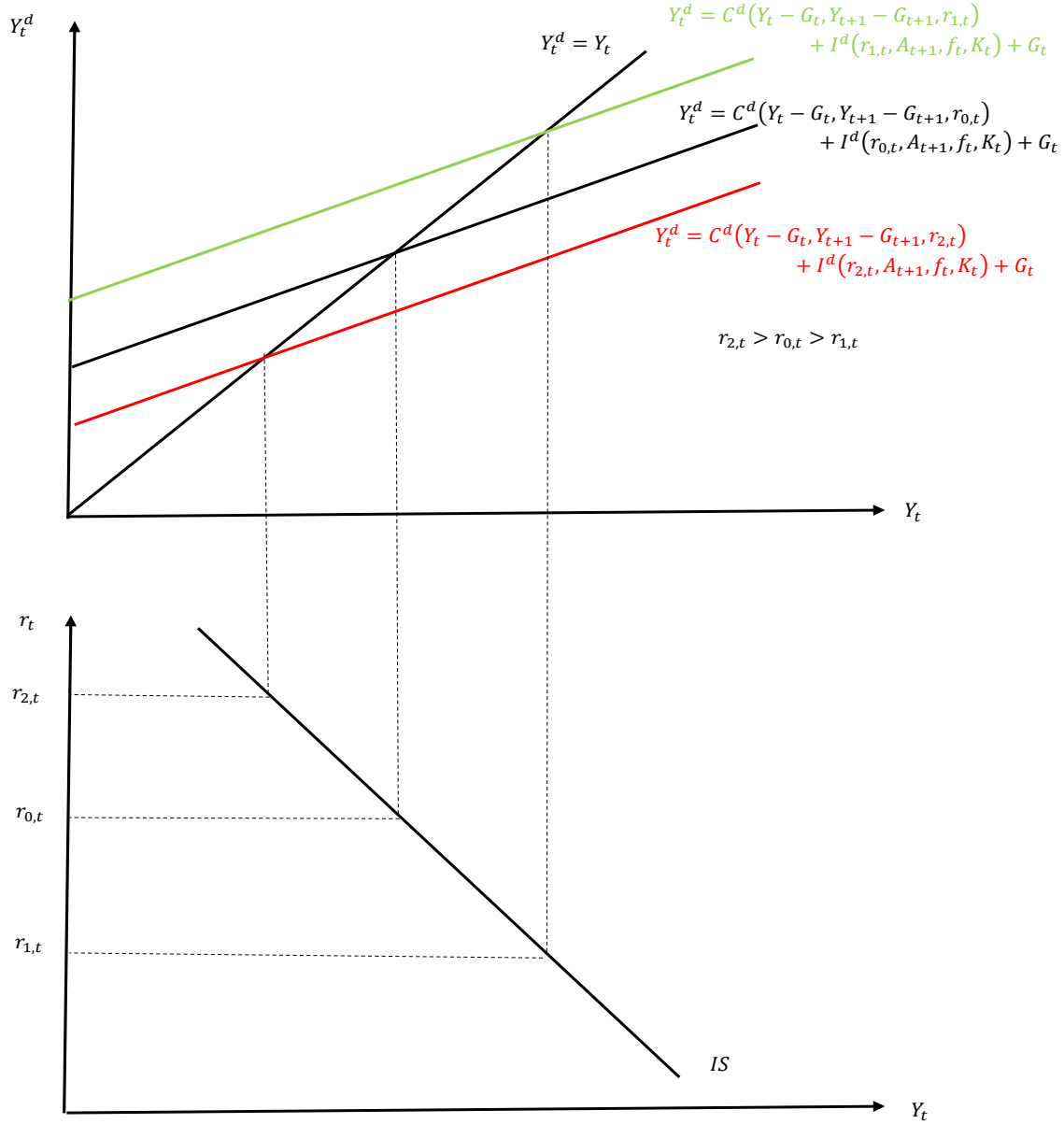
Expenditure vs. Income



Income Equals Expenditure



The *IS* Curve


Y_t^d
$Y_t^d = Y_t$
$Y_t^d = C^d(Y_t - G_t, Y_{t+1} - G_{t+1}, r_{1,t}) + I^d(r_{1,t}, A_{t+1}, f_t, K_t) + G_t$
$Y_t^d = C^d(Y_t - G_t, Y_{t+1} - G_{t+1}, r_{0,t}) + I^d(r_{0,t}, A_{t+1}, f_t, K_t) + G_t$
$Y_t^d = C^d(Y_t - G_t, Y_{t+1} - G_{t+1}, r_{2,t}) + I^d(r_{2,t}, A_{t+1}, f_t, K_t) + G_t$
$r_{2,t} > r_{0,t} > r_{1,t}$
Y_t
r_t
$r_{2,t}$
$r_{0,t}$
$r_{1,t}$
IS
Y_t

IS Curve Shifts

The *IS* curve will shift if any exogenous variable relevant for desired consumption or investment change, as well as changes in government spending:

- $\uparrow A_{t+1}$: *IS* shifts right
- $\uparrow f_t$: *IS* shifts left
- $\uparrow G_t$: *IS* shifts right (via earlier arguments)
- $\uparrow G_{t+1}$: *IS* shifts left
- $\downarrow K_t$: *IS* shifts right

The Y^s Curve

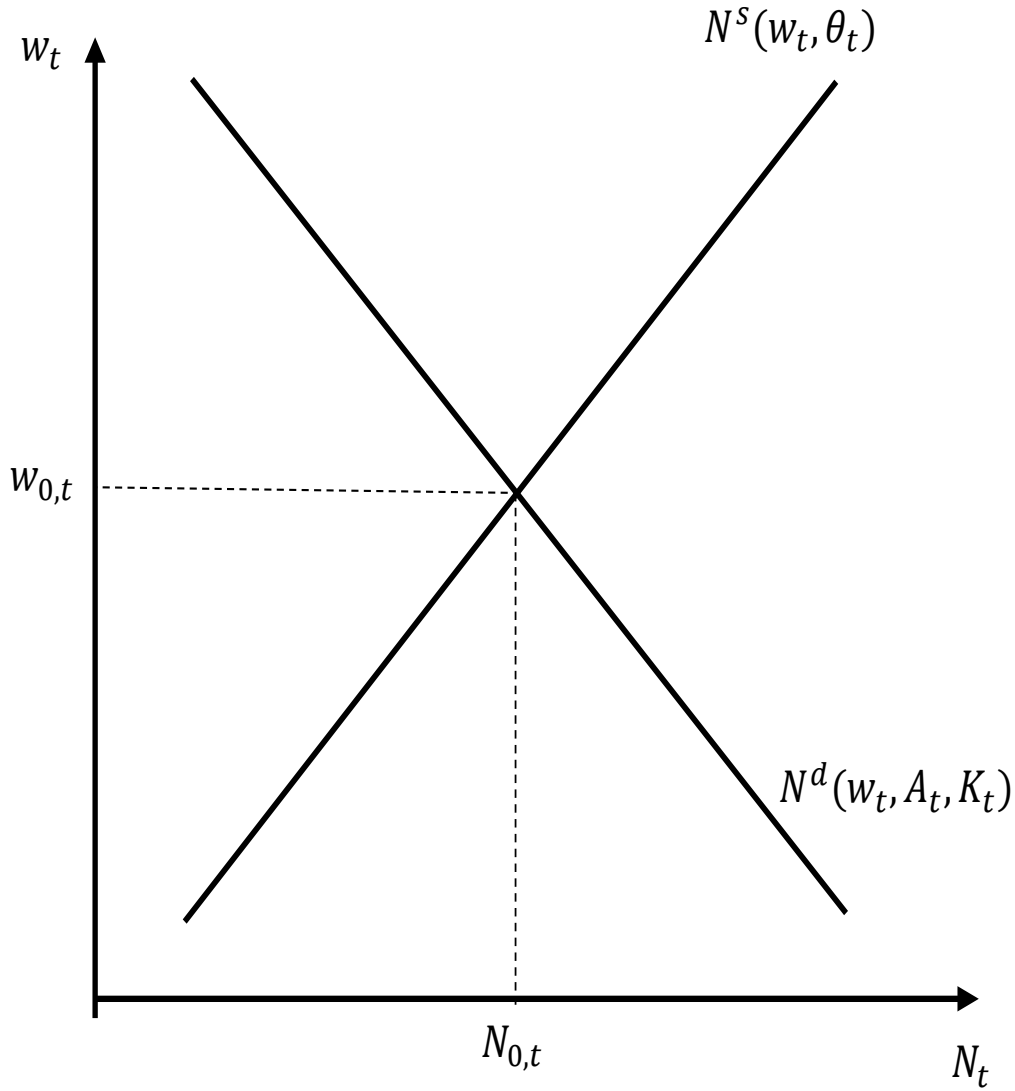
Begin by plotting labor demand and labor supply. Find the N_t where these intersect

Given this N_t, determine Y_t from the production function

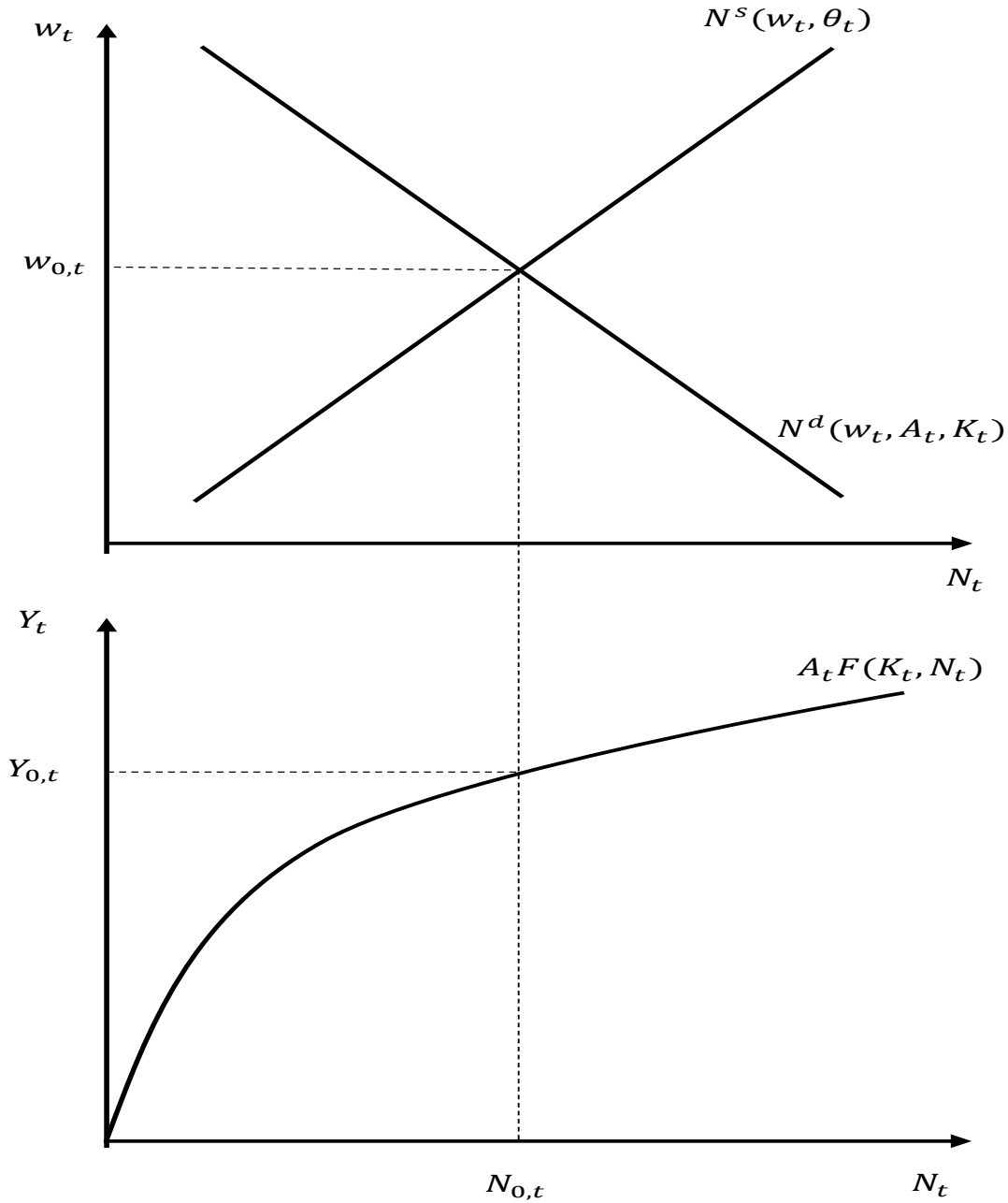
r_t irrelevant for labor demand, supply, and the production function under our assumptions (GHH preferences): Y^s curve is still vertical as in endowment economy

Could generate an upward-sloping Y^s curve, if we considered effect of r_t on labor supply (non-GHH preferences, GLS Appendix C)

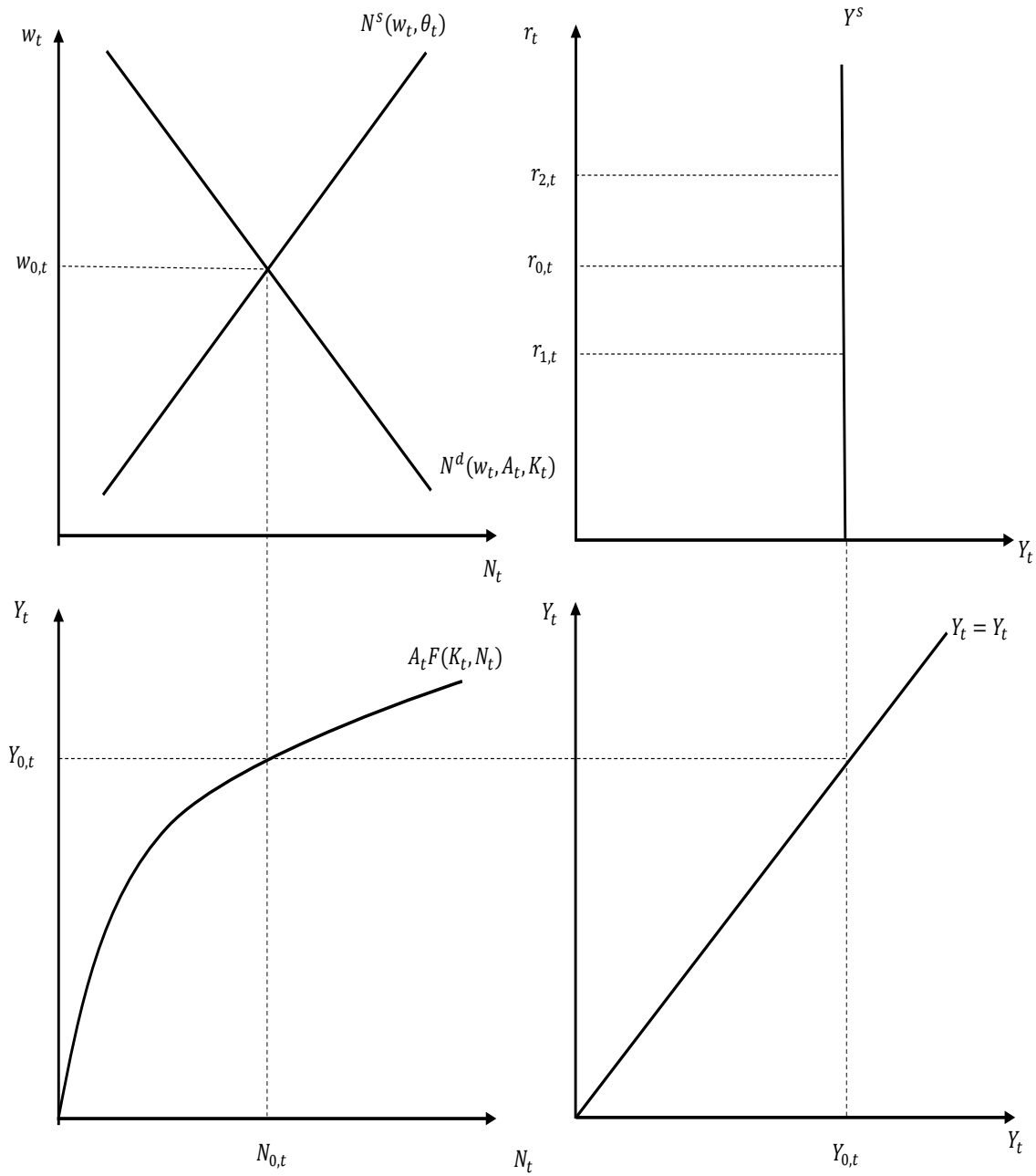
Labor Market



Production Function



The Y^s Curve


w_t
$N^s(w_t, \theta_t)$
$w_{0,t}$
$N^d(w_t, A_t, K_t)$
N_t
r_t
Y^s
$r_{2,t}$
$r_{0,t}$
$r_{1,t}$
Y_t
Y_t
$A_t F(K_t, N_t)$
$Y_{0,t}$
$N_{0,t}$
N_t
Y_t
$Y_t = Y_t$
$Y_{0,t}$
Y_t

Shifts of the Y^s Curve

The Y^s curve will shift if any exogenous variable relevant for the positions of the labor demand, labor supply, or production functions changes"

- $\uparrow A_t$: Y^s shifts right
- $\uparrow \theta_t$: Y^s shifts left
- $\downarrow K_t$: Y^s shifts left

Money Supply & Demand

Money supply is exogenous at some value

Money demand is implicitly characterized by (using the Fisher relationship, $i_t = r_t + \pi^e_{t+1}$:

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

Once you know r_t and Y_t (from intersection of IS and Y^s), you know position of money demand

Plot P_t (vertical axis) vs. M_t (horizontal axis)

Looks funny because money demand is upward-sloping: but "price" of money in terms of goods is $1/P_t$

Money Market