The New Keynesian Model: Dynamics

ECON 30020: Intermediate Macroeconomics

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Readings

- GLS Ch. 24

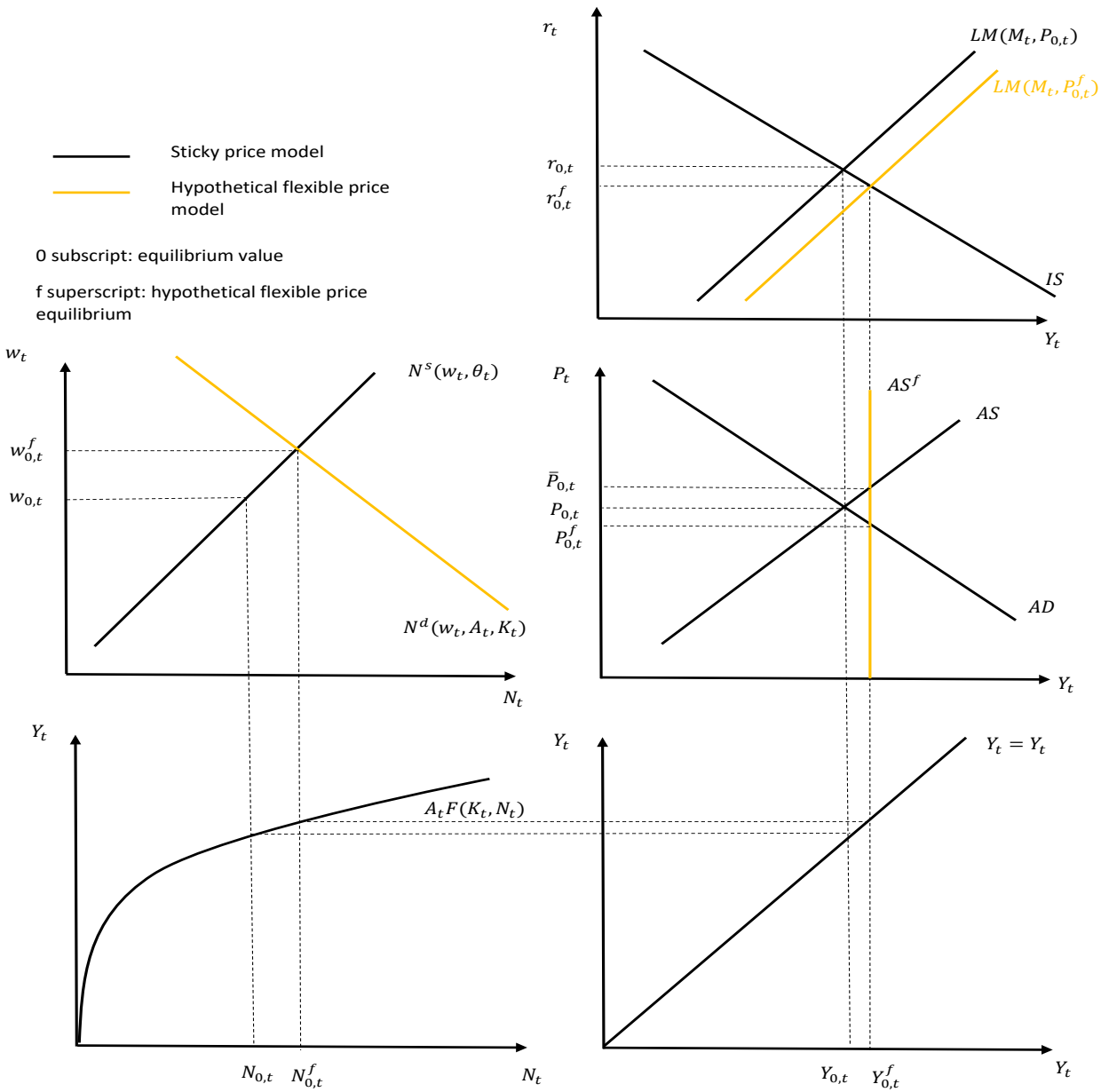
Dynamics

- The New Keynesian model is a special case of the neoclassical model – we simply swap labor demand with an AS curve, most general form of which is:

$$P_t = \bar{P}_t + \gamma(Y_t - Y_t^f)$$

- Call Y_t^f the "flexible price" level of output – the level of output which would emerge in the neoclassical model
- If firm could freely adjust price, it would do so such that it is on its labor demand curve, which would entail $Y_t = Y_t^f$
- Refer to $Y_t - Y_t^f$ as the output gap – the gap between actual output and what it would be in the absence of price stickiness
- To see this graphically, draw in a hypothetical AS curve for the neoclassical model – call this AS^f

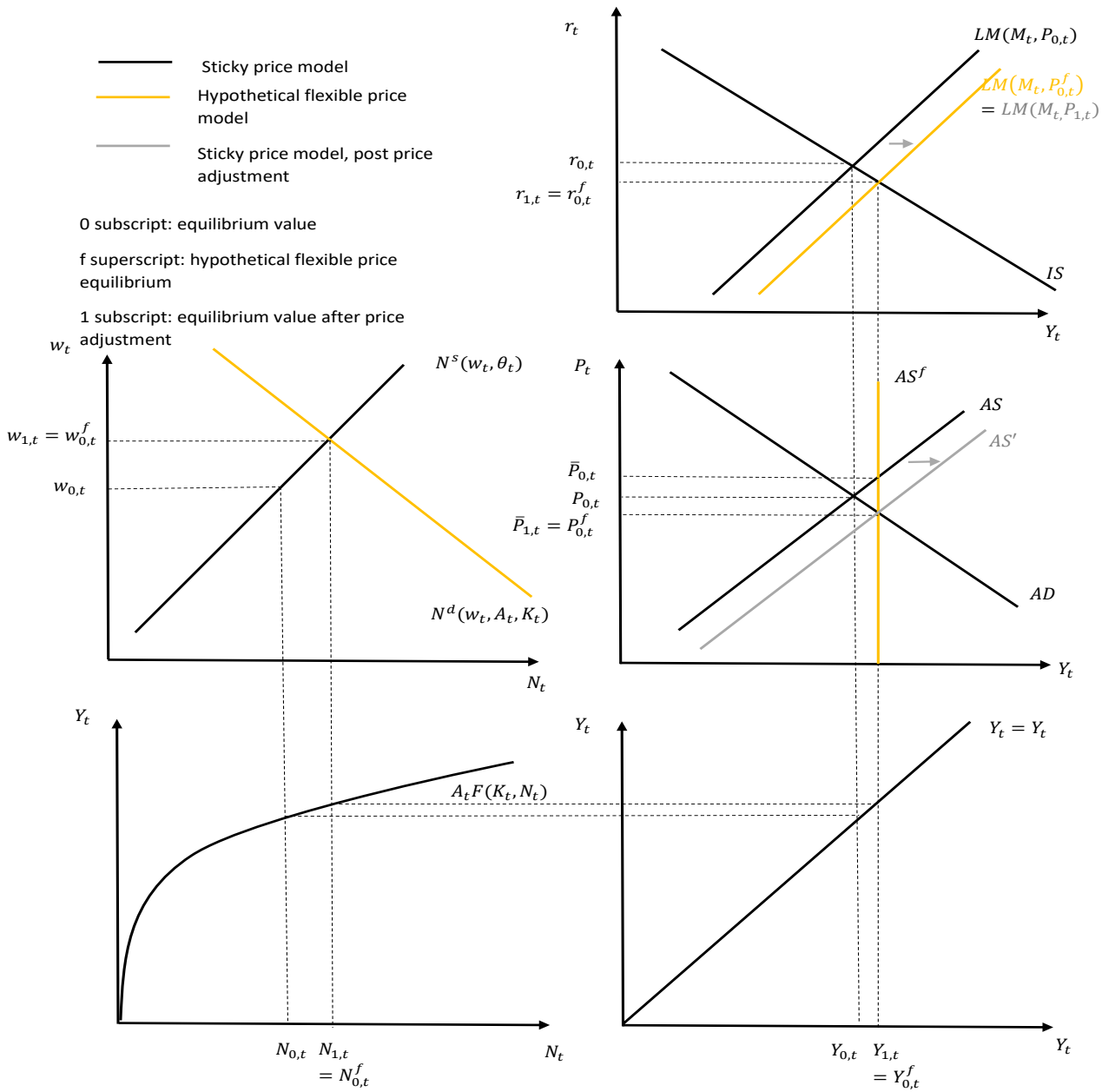
A Negative Output Gap



Transition from Short Run to Medium Run

- With a negative output gap, the firm is producing *less* than it would like
- The reason the gap exists is because a friction (e.g. menu cost) prevents it from lowering price all the way necessary to close the gap
- Given equilibrium real wage, firm would like to hire more labor. But only way to put more labor to use is to have more demand for output, which would require a drop in P_t.
- Once it is given the opportunity to do so, the firm will change $\bar{P}_t$ in such a way that the AS curve intersects the AD curve at Y_t^f
- Hence, as we transition from short run (price sticky) to medium run (price flexible), the exogenous component of the price level, $\bar{P}_t$, will adjust so as to shift the AS curve and "close the gap"
- We will *not* use different time subscripts or anything to think about this transition, so this is admittedly a bit loosey-goosey

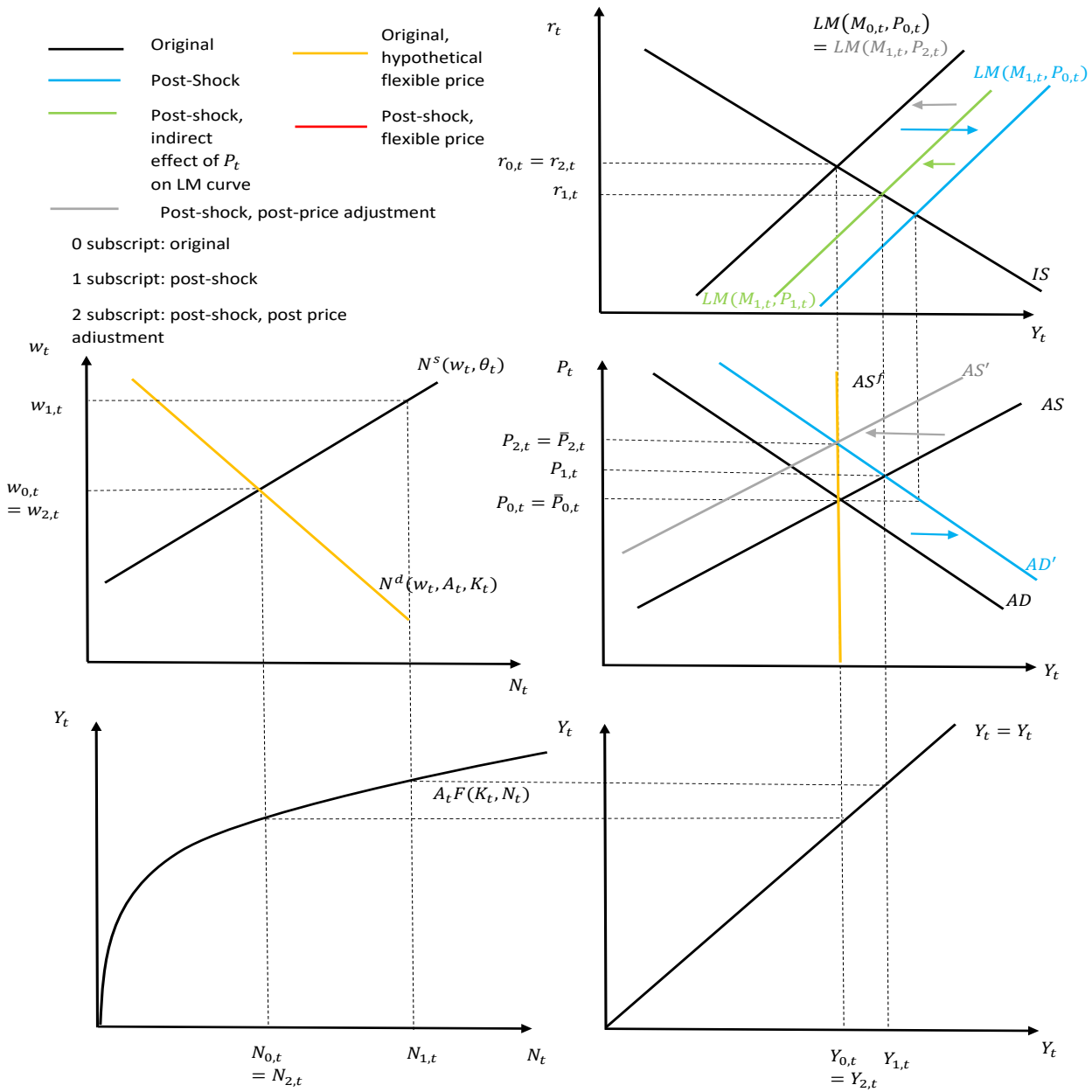
Closing a Negative Output Gap



Dynamic Response to Shocks

- We shall assume that the economy initially sits in the neoclassical, no output gap equilibrium
- Then something exogenous changes and causes either the AD or AS to shift
- This will in general result in a non-zero output gap in the short run
- This will put pressure on $\bar{P}_t$ to adjust to shift the AS curve to close the gap

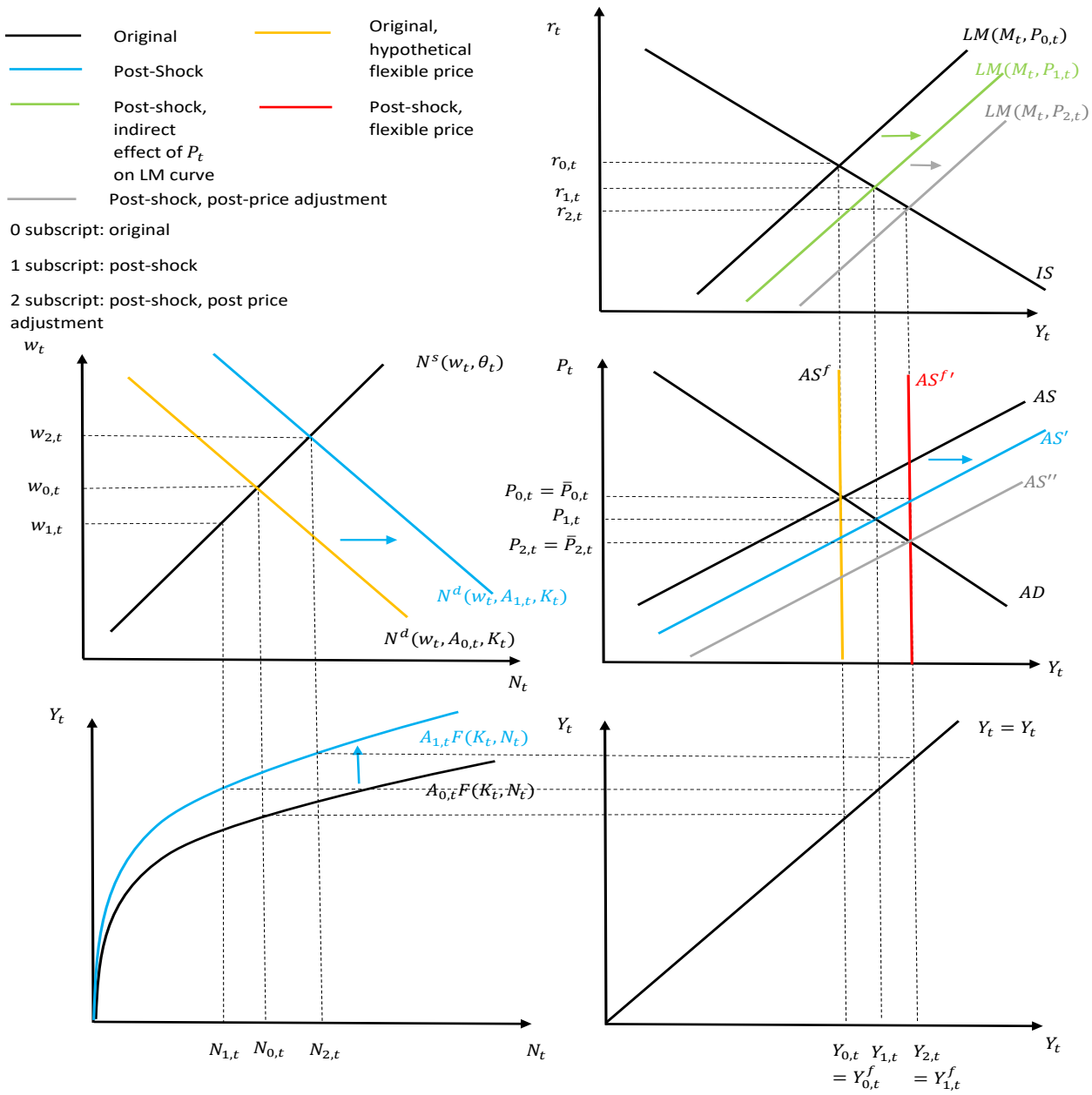
Monetary Shock, $\uparrow M_t$



Monetary Neutrality, Short Run vs. Medium Run

- Money is non-neutral in the short run – AD shifts when M_t changes which causes Y_t (and r_t and other real variables) to change
- But this puts pressure on $\bar{P}_t$
- As economy transitions to medium run, $\bar{P}_t$ adjusts in such a way as to close the output gap, and the neoclassical equilibrium emerges – money is neutral and the classical dichotomy holds

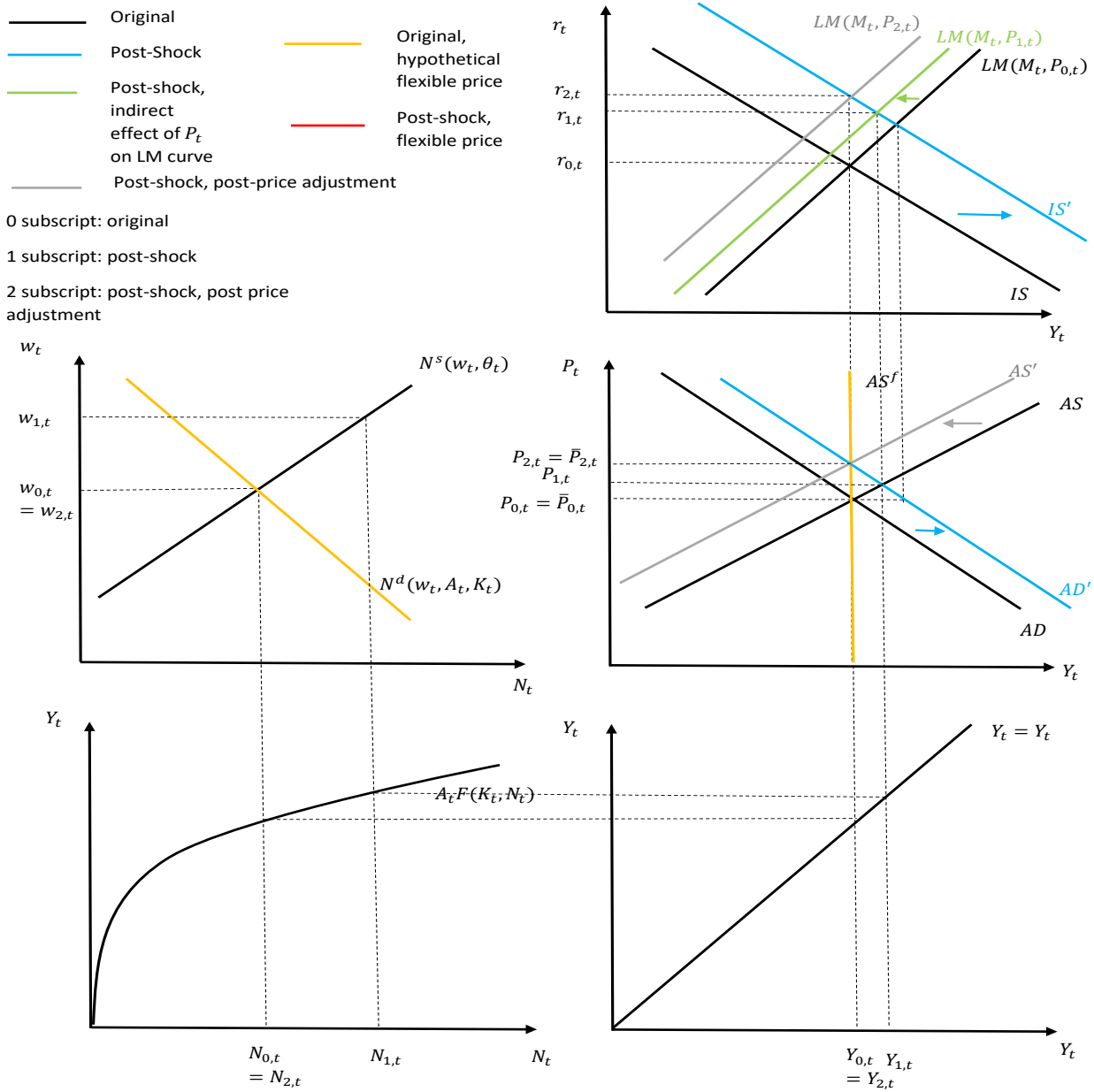
Supply Shock, $\uparrow A_t$



Supply Shock Dynamics

- Output *under-reacts* to A_t in the short run (the more so the flatter is the AS curve, i.e. the smaller is γ)
- The price level falls, but not enough to implement the neoclassical equilibrium
- At new short run equilibrium, firm would like to produce more. Must lower price in order to do this. So downward pressure on $\bar{P}_t$
- AS shifts as economy transitions through time to restore neoclassical equilibrium

IS Shock, e.g. $\uparrow A_{t+1}$



IS Shock Dynamics

- After a positive IS shock, Y_t and P_t both rise
- But at new equilibrium, firm is producing more output than it would find optimal (i.e. labor input exceeds quantity of labor firm would demand at equilibrium real wage)
- Firm wants to reduce labor, which requires increasing P_t to reduce demand
- This results in $\bar{P}_t$ rising, AS shifting in, and neoclassical equilibrium being restored

Phillips Curve

- Our discussion about dynamics above suggests there ought to exist some kind of relationship between the output gap and the *change* in prices (i.e. inflation).
- Subtract previous period's price level from both sides of AS relationship:

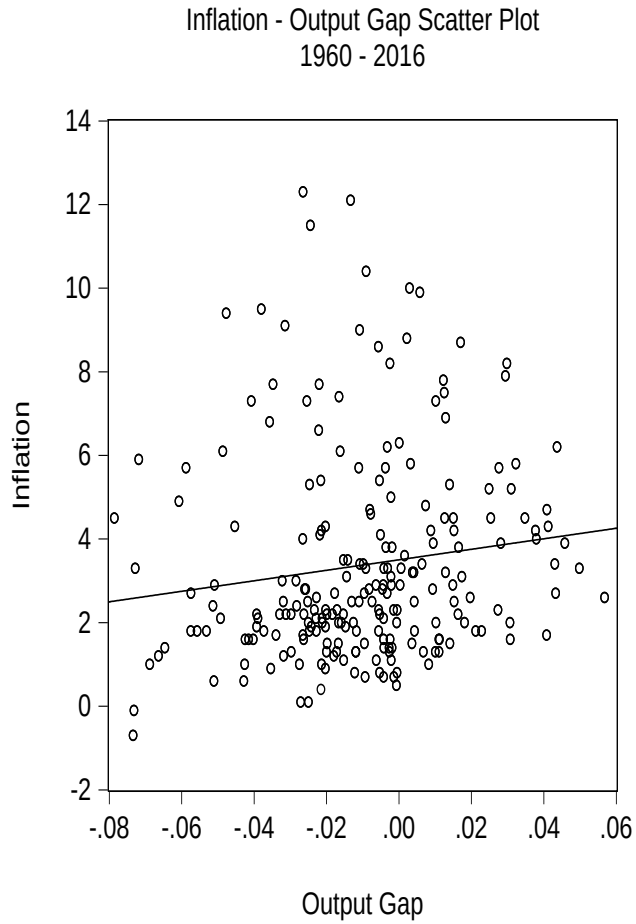
$$P_t - P_{t-1} = \bar{P}_t - P_{t-1} + \gamma(Y_t - Y_t^f)$$

- Normalize previous period's price level to $P_{t-1} = 1$, which means we can re-interpret changes as percentage changes. Call $\pi_t^e = \frac{\bar{P}_t - P_{t-1}}{P_{t-1}}$ the inflation rate expected to obtain between $t-1$ and t. Firm sets $\bar{P}_t$ where if it guesses inflation correctly it will produce $Y_t = Y_t^f$. Then:

$$\pi_t = \pi_t^e + \gamma(Y_t - Y_t^f)$$

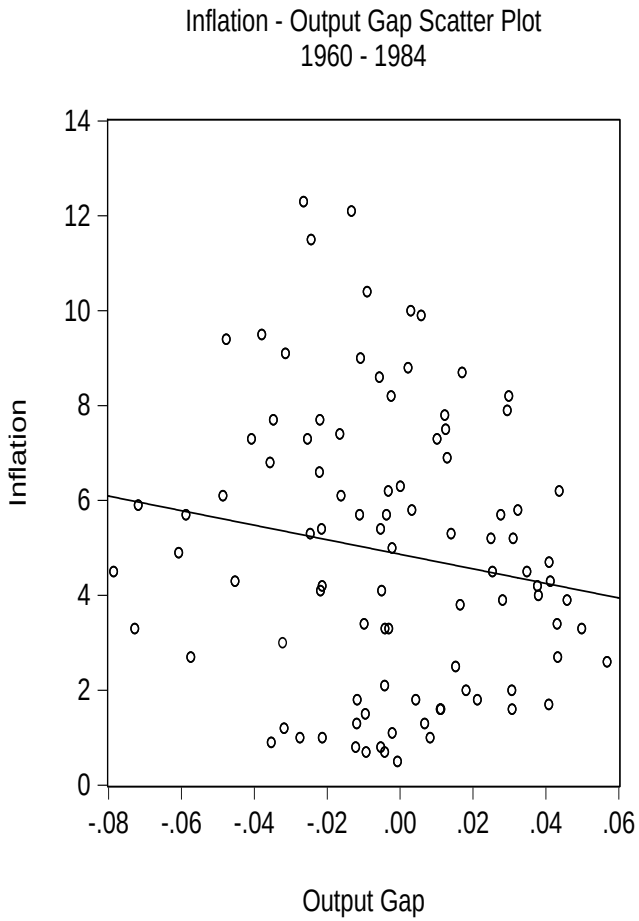
- An equation like this is called a *Phillips Curve* after Phillips (1958)

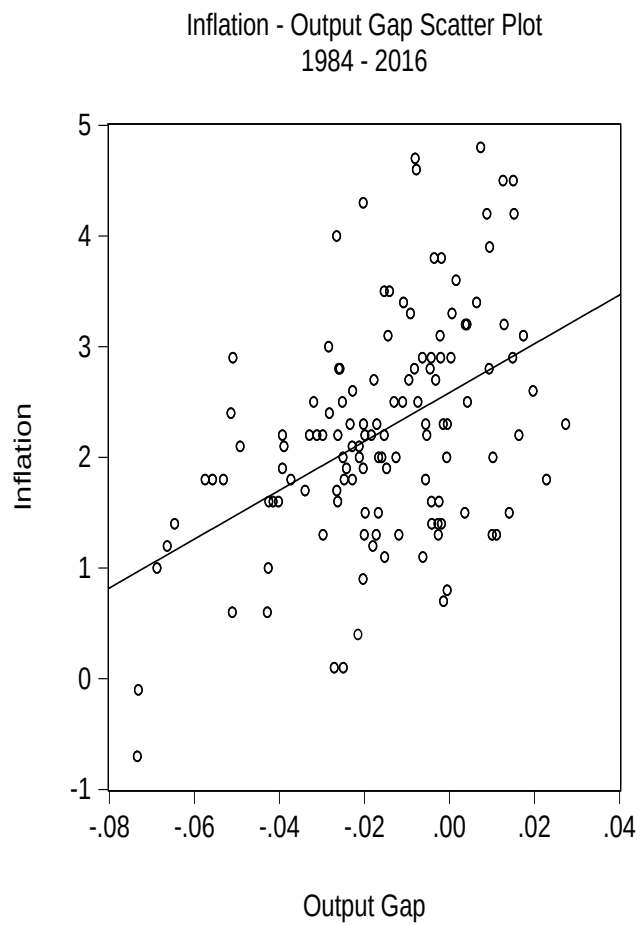
Empirical Relationship Between Inflation and the Output Gap



- Pretty weak – more of a "blob" than a clear positive relationship

Subsample Differences



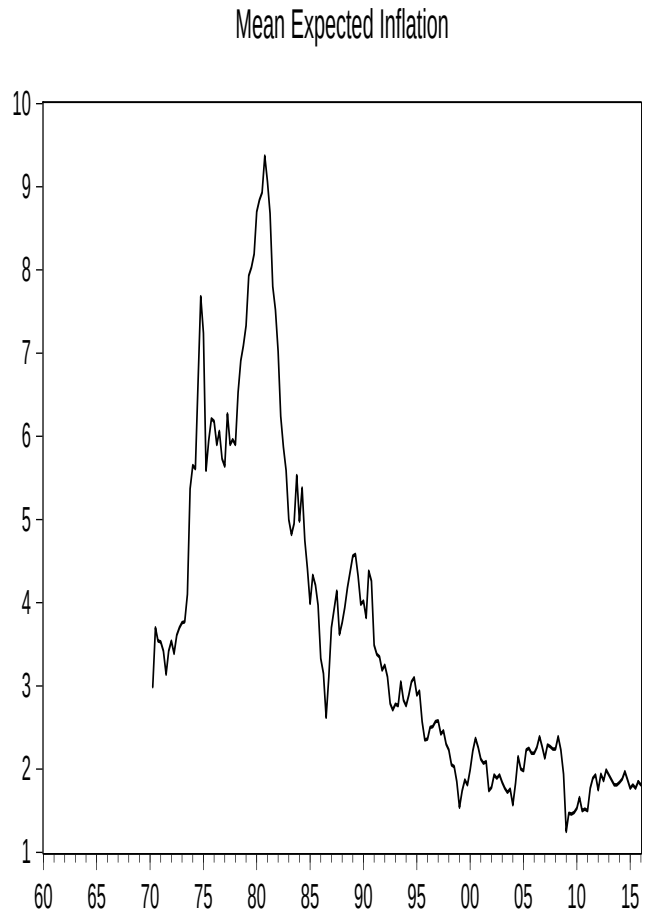


- "Wrong" sign in early sample; looks much closer to theory in later sample

What Gives?

- Does the fact that the sign of the correlation looks "wrong" invalidate the theory?
- Not necessarily – correlation between gap and inflation should only be positive holding π_t^e (equivalently $\bar{P}_t$) fixed
- What do inflation expectations look like in data?
- Large and volatile in early sample; much more stable in later sample

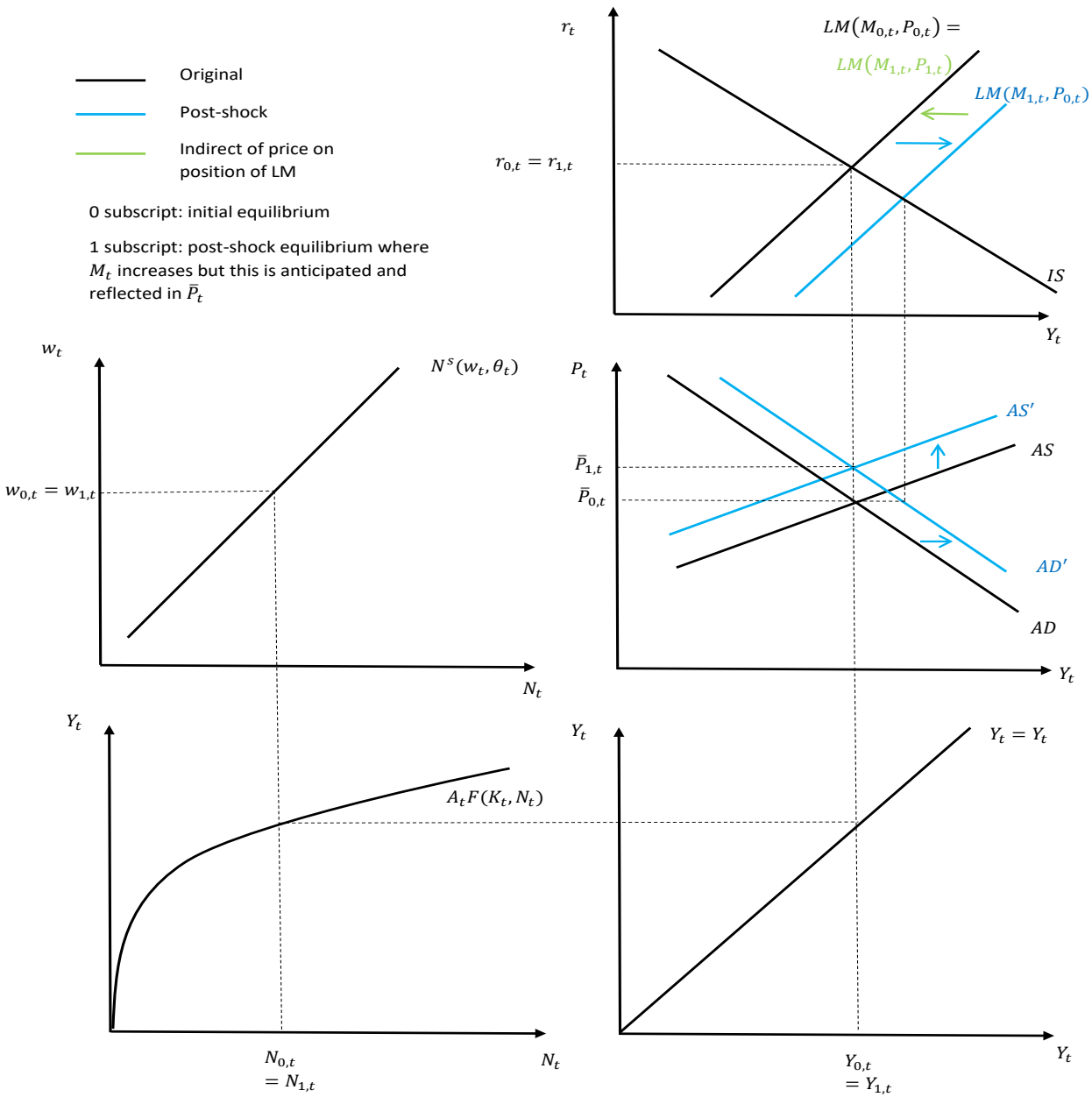
Expected Inflation



Can Monetary Policy Permanently Engineer Higher Output?

- No
- Can temporarily raise output by increasing M_t, but in medium run this puts upward pressure on prices and the effect goes away
- Continually trying to raise output will only result in more inflation
- Further, it may cause the firm to anticipate the change in M_t, which could cause the AS curve to shift simultaneously with the AD shift, resulting in no effect of monetary expansion on output
- It is really only unanticipated monetary expansion that can stimulate output, and even then only for a while

Fully Anticipated Increase in M_t, so that $\bar{P}_t$ also rises



Costless Disinflation

- Can central bank lower prices (disinflation) without incurring an output loss?
- Conventional wisdom for 1980-1982 recession was that it was caused by Fed trying to get inflation under control (negative monetary shock)
- Suppose that the Fed announces in advance that it is going to reduce M_t. If people believe this, prices may adjust down in anticipation, causing AS curve to shift down at same time the AD shifts in
- In principle, this allows for a reduction in P_t with no change in Y_t – i.e. costless disinflation
- Underscores importance of central bank *credibility* and *communication*: for this to work, people must believe the central bank, and the central bank must clearly communicate its objectives