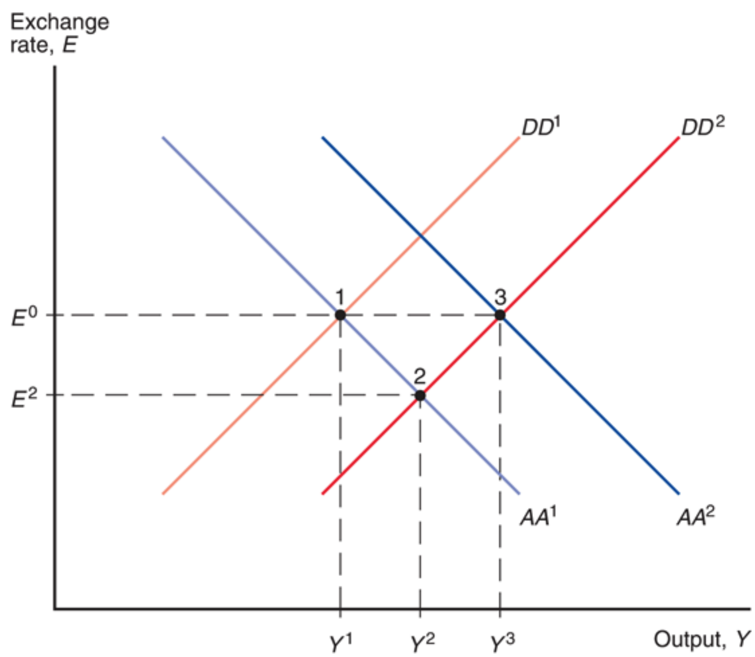
ECON 1550 Spring 2026: Problem Set 7 Answer Key

1. (a) A temporary tax cut raises disposable income and consumption, so the DD curve shifts to the right. A temporary increase in the money supply shifts the AA curve to the right. Because both policies are expansionary, output rises unambiguously.

The initial equilibrium is point 1. The tax cut alone shifts the DD curve from DD^1 to DD^2, with the equilibrium moving from point 1 to point 2. Adding the temporary monetary expansion shifts the AA curve from AA^1 to AA^2, moving the equilibrium from point 2 to point 3.



In the figure, the shifts in AA and DD are such that the exchange rate at point 1 is the same as the exchange rate at point 3. In general, however, the effect on the exchange rate is ambiguous. If the DD shift is relatively large, the new equilibrium can have a lower exchange rate than E^0. If the AA shift is relatively large, the new equilibrium can have a higher exchange rate than E^0.

Summing up, the combined temporary tax cut and temporary monetary expansion raise output, while the effect on the exchange rate is ambiguous.

(b) The expansionary money supply announcement causes a depreciation in the expected exchange rate and shifts the AA curve to the right. This leads to an immediate increase in output and an immediate currency depreciation. The effects of the anticipated policy action thus precede the policy's actual implementation.

(c) A "buy American" provision results in a larger permanent rightward shift in the DD curve than an unconstrained increase in government spending because there is a greater demand for U.S. goods than if some imported goods are purchased with the stimulus funds.

In both cases, the short-run expected exchange rate declines, shifting the AA curve down so that it intersects the DD curve at the point where output equals its full-employment level, that is, $Y = Y^f$. Since the short-run equilibrium has $Y = Y^f$, the AA and DD curves do not shift after the short run, so the long-run equilibrium coincides with the short-run equilibrium.

We conclude that the buy American provision and the unconstrained government spending case result in the same $Y = Y^f$ level of output in the short run and in the long run.

Because the buy American provision shifts the DD more than the unconstrained spending, the shift in the AA required to have $Y = Y^f$ is also larger for the buy American provision, and the currency appreciates more.

Additional information (not part of the answer): Because the buy American provision shifts the DD curve farther to the right than unconstrained government spending, keeping equilibrium at $Y = Y^f$ requires a larger downward shift in the AA curve. As a result, the domestic currency appreciates more under the buy American provision than under unconstrained government spending.

(d) When spending is temporary, a "buy American" provision has a larger effect on output in the short run, since the AA curve does not shift because exchange rate expectations remain unchanged.

In the long run, the economy returns to $Y = Y^f$ in both cases, making the long-run effect on output the same with and without "buy American" provisions.

2. (a) Write imports as

$$IM(q, Y - T) = qV(q, Y - T).$$

The price effect is that when q rises, each imported unit costs more in terms of domestic goods, which tends to raise IM for a given import volume. The volume effect is that when q rises, domestic residents buy fewer imported units, which tends to lower IM.

In this model,

$$V(q, Y - T) = \frac{5 + 2(Y - T)}{20q} - \frac{1}{10}.$$

Holding $Y - T$ fixed, a rise in q lowers the term $\frac{5+2(Y-T)}{20q}$, so import volume is decreasing in q.

Imports (expressed in units of domestic goods) are:

$$IM(q, Y-T) = q\left(\frac{5+2(Y-T)}{20q} - \frac{1}{10}\right) = \frac{5+2(Y-T)}{20} - \frac{q}{10}.$$

Since IM is decreasing in q, the fall in import volume more than offsets the higher price per imported unit. In this model, the volume effect dominates the price effect.

(b) From part (a),

$$IM = \frac{5+2Y}{20} - \frac{q}{10} = \frac{1}{4} + \frac{Y}{10} - \frac{q}{10},$$

because $T = 0$, so $Y - T = Y$.

Exports are

$$EX = \frac{1}{4} + \frac{q}{10},$$

because $Y^* = 1$.

So the current account is

$$CA = EX - IM = \left(\frac{1}{4} + \frac{q}{10}\right) - \left(\frac{1}{4} + \frac{Y}{10} - \frac{q}{10}\right) = \frac{q}{5} - \frac{Y}{10}.$$

Aggregate demand for domestic goods is

$$D = C + I + G + CA = \frac{1}{2}Y + \frac{1}{5} + \frac{1}{5} + \frac{q}{5} - \frac{Y}{10} = \frac{2}{5}Y + \frac{2}{5} + \frac{q}{5}.$$

Goods-market equilibrium requires $Y = D$, so

$$Y = \frac{2}{5}Y + \frac{2}{5} + \frac{q}{5}.$$

Re-arranging,

$$\frac{3}{5}Y = \frac{2}{5} + \frac{q}{5},$$

so

$$q = 3Y - 2.$$

Because $q = EP^*/P$ and $P^* = 1$, the DD curve is

$$E = P(3Y - 2).$$

Points on the DD curve are pairs (E, Y) that are consistent with equilibrium in the market for domestic goods.

In this version of the model, DD is a straight line. Its slope is $3P$, and its vertical intercept is $-2P$.

The DD curve is increasing. A higher level of output raises disposable income, consumption, and imports. To keep the market for domestic goods in equilibrium, the real exchange rate must depreciate (higher q) so that exports rise and imports fall enough to offset the increase in domestic absorption. With P and P^* fixed, a higher q requires a higher nominal exchange rate E.

(c) The money market is

$$\frac{1}{P} = \frac{Y}{1+R},$$

because $M^s = 1$.

So

$$1 + R = PY,$$

and therefore

$$R = PY - 1.$$

Uncovered interest parity is

$$R = \frac{E^e}{E} - 1,$$

because $R^* = 0$.

Substitute the money-market expression for R into uncovered interest parity:

$$PY - 1 = \frac{E^e}{E} - 1.$$

So

$$PY = \frac{E^e}{E},$$

which implies

$$E = \frac{E^e}{PY}.$$

This is the AA curve.

Points on the AA curve are pairs (E, Y) that are consistent with asset-market equilibrium, meaning equilibrium in the money market together with equilibrium in the foreign-exchange market.

The AA curve is decreasing. If Y rises, people want to hold more money. With the money supply fixed, the interest rate must rise to make people willing to hold the available money. A higher domestic interest rate makes domestic bonds more attractive. For uncovered interest parity to continue to hold, the domestic currency must be more appreciated today, which means a lower E.

(d) With the given parameter values, the Phillips curve becomes

$$\pi = Y - 1.$$

In the long run, output equals full-employment output:

$$Y_0 = Y^f = 1.$$

So inflation is

$$\pi_0 = Y_0 - 1 = 0.$$

In the long run, expected and actual exchange rates are equal:

$$E_0^e = E_0.$$

Uncovered interest parity then gives

$$R_0 = R_0^* + \frac{E_0^e}{E_0} - 1 = 0 + 1 - 1 = 0.$$

The money market gives

$$\frac{1}{P_0} = \frac{Y_0}{1 + R_0} = \frac{1}{1},$$

so

$$P_0 = 1.$$

The DD relation from part (b) is

$$q = 3Y - 2.$$

At $Y_0 = 1$,

$$q_0 = 1.$$

Since $q_0 = E_0/P_0$ and $P_0 = 1$,

$$E_0 = 1.$$

Therefore

$$E_0^e = 1.$$

The remaining endogenous variables are

$$Y_0 - T = 1, \quad C_0 = \frac{1}{2}, \quad EX_0 = \frac{7}{20},$$

$$IM_0 = \frac{1}{4}, \quad CA_0 = \frac{1}{10}, \quad D_0 = 1.$$

So the initial long-run equilibrium is

$$Y_0 = 1, \quad E_0 = 1, \quad q_0 = 1, \quad R_0 = 0, \quad P_0 = 1, \quad \pi_0 = 0.$$

(e) With the tariff,

$$V((1+\tau)q, Y) = \frac{5+2Y}{20(1+\tau)q} - \frac{1}{10},$$

because $T = 0$, so $Y - T = Y$.

Imports are therefore

$$IM(q,\tau,Y) = qV((1+\tau)q, Y) = q\left(\frac{5+2Y}{20(1+\tau)q} - \frac{1}{10}\right) = \frac{5+2Y}{20(1+\tau)} - \frac{q}{10}.$$

So the current account is

$$CA(q,\tau,Y) = \left(\frac{1}{4} + \frac{q}{10}\right) - \left(\frac{5+2Y}{20(1+\tau)} - \frac{q}{10}\right).$$

Holding q and Y fixed, a higher tariff makes the term $\frac{5+2Y}{20(1+\tau)}$ smaller. So imports fall and the current account rises.

The intuition is simple. At a fixed real exchange rate and a fixed level of output, the tariff makes imported goods more expensive for domestic buyers. Domestic residents therefore buy fewer imports, and that improves the current account.

(f) From part (e),

$$IM = \frac{5+2Y}{20(1+\tau)} - \frac{q}{10}.$$

Exports are unchanged by the home import tariff:

$$EX = \frac{1}{4} + \frac{q}{10}.$$

So the current account is

$$CA = EX - IM = \frac{1}{4} - \frac{1}{4(1+\tau)} + \frac{q}{5} - \frac{Y}{10(1+\tau)}.$$

Aggregate demand for domestic goods is

$$D = \frac{1}{2}Y + \frac{1}{5} + \frac{1}{5} + \frac{1}{4} - \frac{1}{4(1+\tau)} + \frac{q}{5} - \frac{Y}{10(1+\tau)}.$$

So

$$D = \frac{1}{2}Y + \frac{13}{20} - \frac{1}{4(1+\tau)} + \frac{q}{5} - \frac{Y}{10(1+\tau)}.$$

Set $Y = D$:

$$Y = \frac{1}{2}Y + \frac{13}{20} - \frac{1}{4(1+\tau)} + \frac{q}{5} - \frac{Y}{10(1+\tau)}.$$

Move the Y-terms to the left:

$$\left(\frac{1}{2} + \frac{1}{10(1+\tau)}\right)Y = \frac{13}{20} - \frac{1}{4(1+\tau)} + \frac{q}{5}.$$

So

$$\frac{6+5\tau}{10(1+\tau)}Y = \frac{8+13\tau}{20(1+\tau)} + \frac{q}{5}.$$

Solving for q,

$$q = \frac{(12+10\tau)Y - 8 - 13\tau}{4(1+\tau)}.$$

Because $q = EP^*/P$ and $P^* = 1$, the DD curve with tariffs is

$$E = P\left[\frac{12+10\tau}{4(1+\tau)}Y - \frac{8+13\tau}{4(1+\tau)}\right].$$

This is again a straight line. Its slope is

$$m_{DD}(\tau) = P\frac{12+10\tau}{4(1+\tau)} = P\frac{6+5\tau}{2(1+\tau)},$$

and its vertical intercept is

$$b_{DD}(\tau) = -P\frac{8+13\tau}{4(1+\tau)}.$$

Without tariffs, the slope is $3P$ and the intercept is $-2P$. With a positive tariff, the slope is smaller because

$$\frac{6+5\tau}{2(1+\tau)} < 3,$$

and the intercept is lower because

$$\frac{8+13\tau}{4(1+\tau)} > 2.$$

So in an E-against-Y graph, the tariff DD curve is flatter and lies below the no-tariff DD curve. That is the same as saying DD shifts to the right.

If you solve instead for Y as a function of E, you get

$$Y = \frac{2(1+\tau)}{P(6+5\tau)}E + \frac{8+13\tau}{2(6+5\tau)}.$$

Both the slope and the intercept in that version are higher than in the no-tariff case, which makes the rightward shift especially easy to see.

The intuition is that the tariff already reduces imports. Because domestic demand is redirected away from foreign goods and toward domestic goods, the economy needs less depreciation to keep the market for domestic goods in equilibrium.

(g) The tariff does not enter the money market or uncovered interest parity. So the AA curve is the same as before:

$$E = \frac{E^e}{PY}.$$

AA is not a straight line. So it does not have one constant slope or a finite vertical intercept.

If a tariff change leaves E^e unchanged, then AA is unchanged. That means the curve keeps exactly the same shape.

This is what happens for a temporary tariff increase. In that case, the long-run exchange rate is unchanged, so E^e is unchanged, and the whole AA curve stays where it was.

A permanent tariff increase is different. It changes the long-run exchange rate, so it changes E^e. Here the permanent tariff lowers the long-run exchange rate. So every point on

$$E = \frac{E^e}{PY}$$

is multiplied by a smaller number. The whole AA curve shifts down, but its downward shape is unchanged.

The intuition is that the AA curve comes from equilibrium in asset markets. Current tariffs work through the goods market, not directly through money demand or interest parity. AA moves only if the tariff changes the expected future exchange rate.

(h) Since the shock is transitory, the long-run equilibrium after the temporary tariff shock is the initial long-run equilibrium:

$$Y_{LR} = 1, \quad E_{LR} = 1, \quad q_{LR} = 1, \quad P_{LR} = 1.$$

So on impact,

$$E^e_{SR} = E_{LR} = 1.$$

The short-run price level is fixed at the initial value:

$$P_{SR} = P_0 = 1.$$

On impact, AA is unchanged because the shock is temporary and E^e is unchanged:

$$AA_{SR}: \quad E = \frac{1}{Y}.$$

The DD curve shifts to the right. With $\tau = 1/3$ and $P = 1$, the tariff DD curve is

$$DD_{SR}: \quad E = \frac{46Y - 37}{16}.$$

The short-run equilibrium solves

$$\frac{46Y_{SR} - 37}{16} = \frac{1}{Y_{SR}},$$

so

$$46Y_{SR}^2 - 37Y_{SR} - 16 = 0.$$

The positive solution is

$$Y_{SR} = 1.116.$$

Therefore

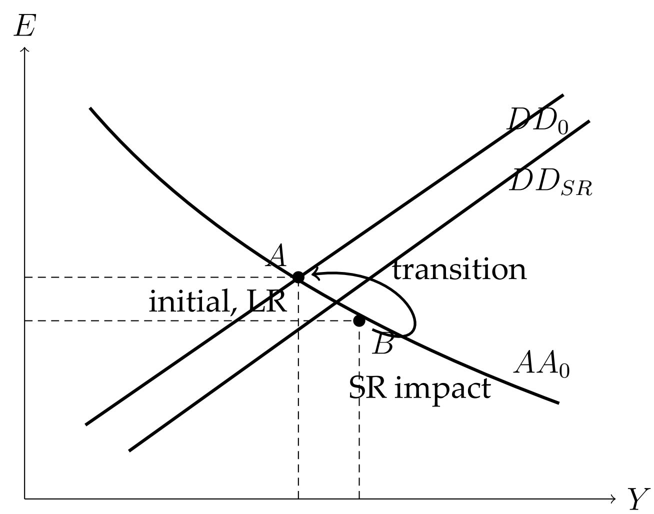
$$E_{SR} = \frac{1}{Y_{SR}} = 0.896, \quad q_{SR} = \frac{E_{SR}}{P_{SR}} = 0.896.$$

So on impact the economy moves from the initial point A to the short-run point B, with higher Y and lower E. The tariff shifts spending toward domestic goods. That raises output and the exchange rate appreciates.

Because $Y_{SR} > Y^f = 1$, short-run inflation is positive:

$$\pi_{SR} = Y_{SR} - 1 = 0.116.$$

Immediately after the impact, the tariff returns to zero. So the economy begins to transition back toward the original long-run equilibrium. Because this temporary tariff affects the economy only at the impact instant, the short-run shift in the DD immediately reverses after the short run. The equilibrium at all times after the short run is the same as the initial long-run equilibrium. A qualitatively correct sketch therefore shows the original equilibrium A, the short-run impact point B, and a return from B back to A.



(i) At the initial long-run equilibrium,

$$E_0 = 1, \quad q_0 = 1, \quad Y_0 = 1, \quad P_0 = 1,$$
$$\pi_0 = 0, \quad CA_0 = \frac{1}{10}, \quad EX_0 = \frac{7}{20}, \quad IM_0 = \frac{1}{4}.$$

At the short-run equilibrium from part (h),

$$Y_{SR} = 1.116, \quad E_{SR} = 0.896, \quad q_{SR} = 0.896, \quad P_{SR} = 1, \quad \pi_{SR} = 0.116.$$

The external variables at SR are

$$EX_{SR} = \frac{1}{4} + \frac{1}{10}q_{SR} = 0.340,$$

$$IM_{SR} = \frac{5 + 2Y_{SR}}{20(1 + 1/3)} - \frac{q_{SR}}{10} = 0.182,$$
$$CA_{SR} = EX_{SR} - IM_{SR} = 0.158.$$

In the long run, the temporary tariff is gone and the economy returns to the initial long-run equilibrium:

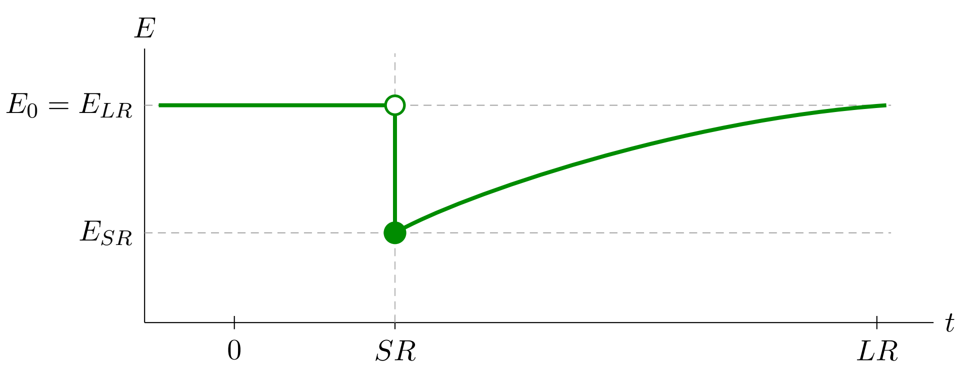
$$E_{LR} = 1, \quad q_{LR} = 1, \quad Y_{LR} = 1, \quad P_{LR} = 1,$$
$$\pi_{LR} = 0, \quad CA_{LR} = \frac{1}{10}, \quad EX_{LR} = \frac{7}{20}, \quad IM_{LR} = \frac{1}{4}.$$

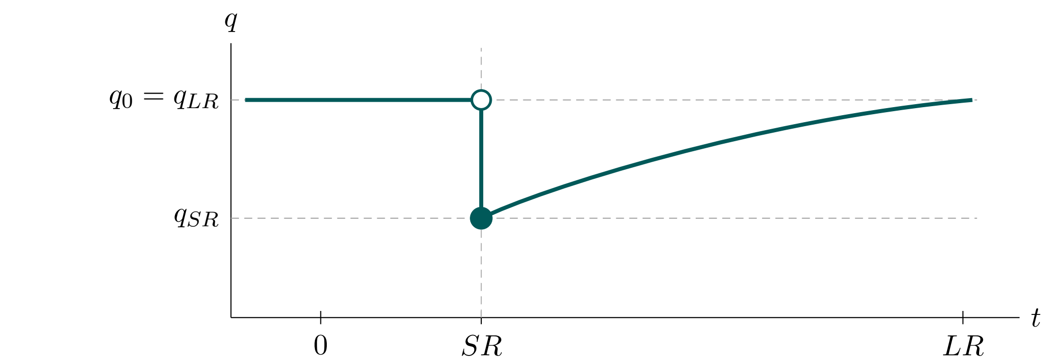
A convenient summary table for the values at 0, SR, and LR is

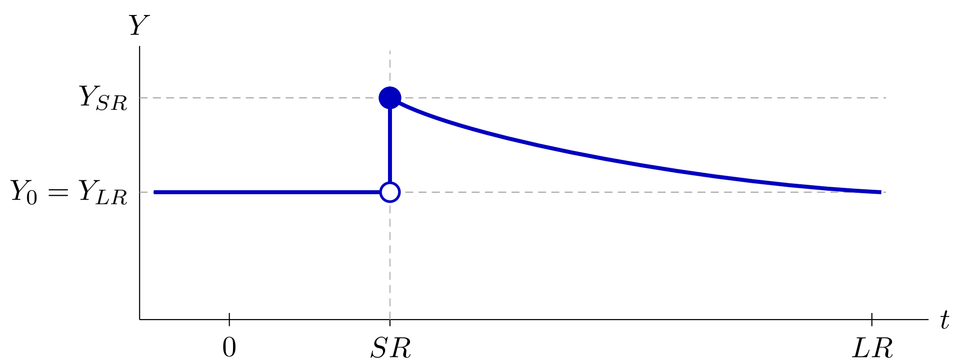
Variable	0	SR	LR
E	1.000	0.896	1.000
q	1.000	0.896	1.000
Y	1.000	1.116	1.000
P	1.000	1.000	1.000
π	0.000	0.116	0.000
CA	0.100	0.158	0.100
EX	0.350	0.340	0.350
IM	0.250	0.182	0.250

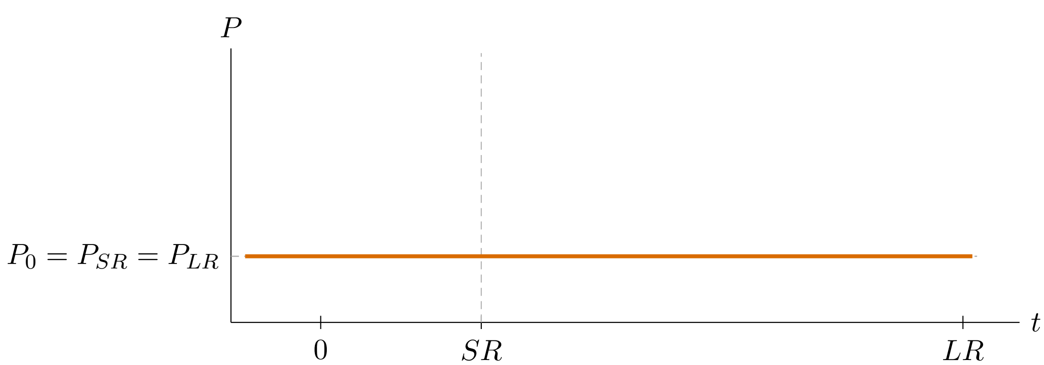
Because the temporary tariff is treated as a short-run impact only, each variable jumps to its impact value at SR and then jumps back to the initial equilibrium's value immediately after. So E and q jump down and then rise back, Y jumps up and then falls back, P is unchanged at the impact instant and stays at its original level, π jumps up and then falls back to zero, CA jumps up and then falls back, and both EX and IM jump down and then rise back to their original values.

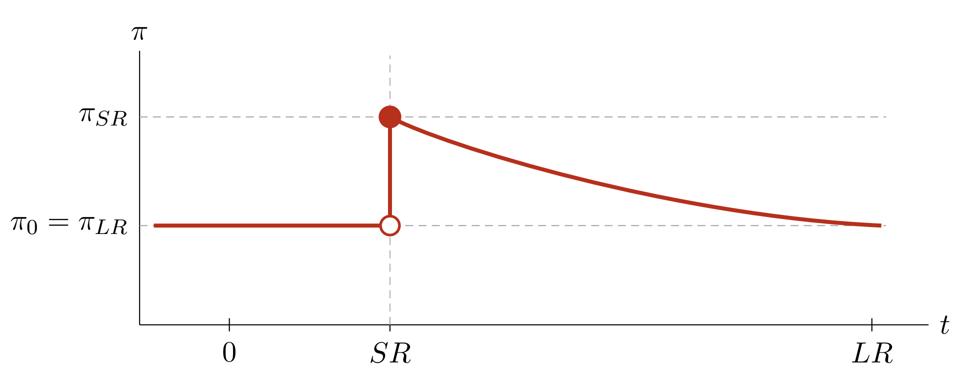
One set of qualitatively correct paths is shown below.

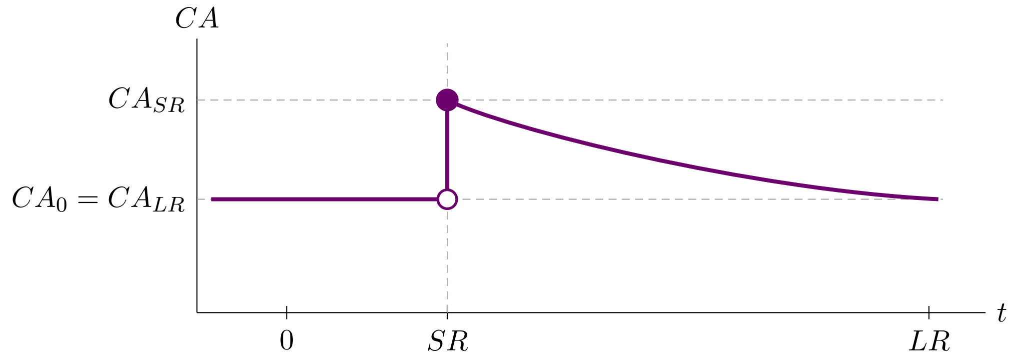


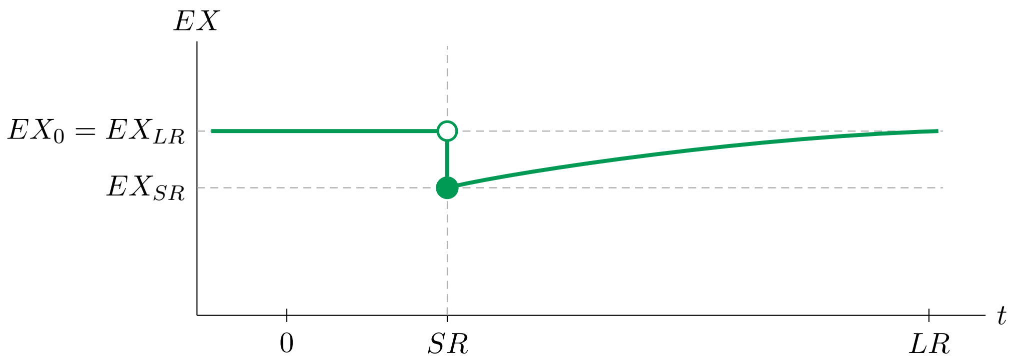

q
$q_0 = q_{LR}$
q_{SR}
t
0
SR
LR

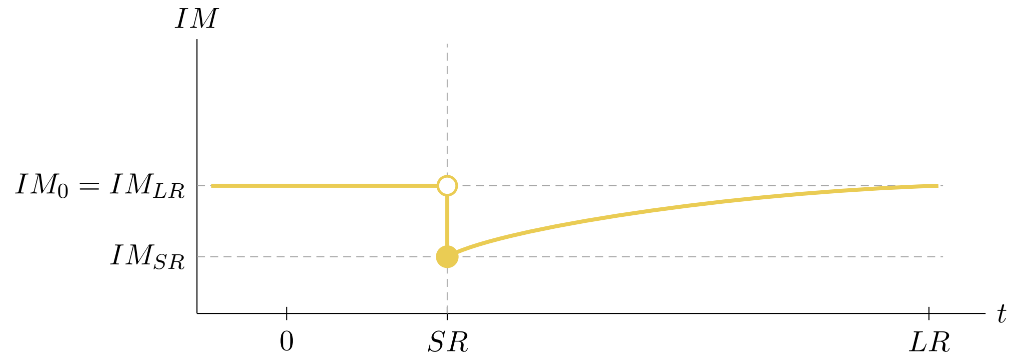

Y
Y_{SR}
$Y_0 = Y_{LR}$
t
0
SR
LR


P
$P_0 = P_{SR} = P_{LR}$
t
0
SR
LR


π
π_{SR}
$\pi_0 = \pi_{LR}$
t
0
SR
LR







(j) Now the tariff stays at $1/3$ in both the short run and the long run:

$$\tau_{SR} = \tau_{LR} = \frac{1}{3}.$$

In the long run, output is still at full employment:

$$Y_{LR} = 1.$$

The money supply, foreign interest rate, and full-employment output are unchanged, so the long-run money market still gives

$$P_{LR} = 1, \quad R_{LR} = 0.$$

Use the tariff DD relation from part (f):

$$q = \frac{(12 + 10\tau)Y - 8 - 13\tau}{4(1+\tau)}.$$

At $Y = 1$ and $\tau = 1/3$,

$$q_{LR} = \frac{46 - 37}{16} = \frac{9}{16}.$$

Since $P_{LR} = 1$, the long-run exchange rate is

$$E_{LR} = q_{LR} = \frac{9}{16}.$$

So on impact,

$$E^e_{SR} = E_{LR} = \frac{9}{16}.$$

The short-run price level is still fixed at

$$P_{SR} = P_0 = 1.$$

With $\tau = 1/3$, the DD curve on impact is

$$DD_{SR}: \quad E = \frac{46Y - 37}{16}.$$

The AA curve on impact is

$$AA_{SR}: \quad E = \frac{9}{16Y}.$$

Solve for the short-run equilibrium:

$$\frac{46Y_{SR} - 37}{16} = \frac{9}{16Y_{SR}}.$$

So

$$46Y_{SR}^2 - 37Y_{SR} - 9 = 0.$$

This factors as

$$(Y_{SR} - 1)(46Y_{SR} + 9) = 0.$$

The positive solution is

$$Y_{SR} = 1.$$

Therefore

$$E_{SR} = \frac{9}{16}, \quad q_{SR} = \frac{9}{16}, \quad R_{SR} = 0.$$

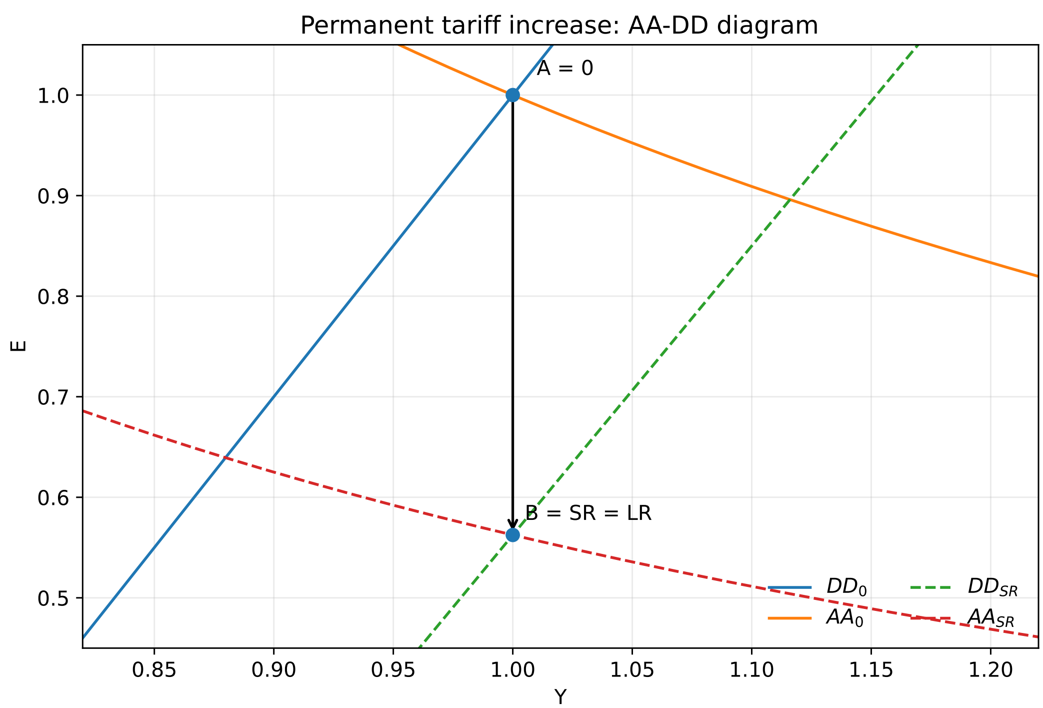
Because $Y_{SR} = Y^f = 1$, inflation is zero:

$$\pi_{SR} = 0.$$

So the price level does not change and the short-run equilibrium is already the long-run equilibrium.

In words, DD shifts to the right because the tariff reduces imports. AA shifts down because the permanent tariff lowers the expected future exchange rate. Those two shifts exactly offset each other in terms of output. The new equilibrium has the same Y as before, but a lower E.

The figure below shows one correct diagram.



(k) From part (j), the short-run and long-run equilibria are the same:

$$Y_{SR} = Y_{LR} = 1, \quad P_{SR} = P_{LR} = 1,$$
$$E_{SR} = E_{LR} = \frac{9}{16}, \quad q_{SR} = q_{LR} = \frac{9}{16}, \quad \pi_{SR} = \pi_{LR} = 0.$$

Exports and imports are

$$EX_{SR} = EX_{LR} = \frac{1}{4} + \frac{1}{10}\frac{9}{16} = \frac{49}{160} = 0.306,$$

$$IM_{SR} = IM_{LR} = \frac{5+2}{20(1+1/3)} - \frac{1}{10}\frac{9}{16} = \frac{33}{160} = 0.206.$$

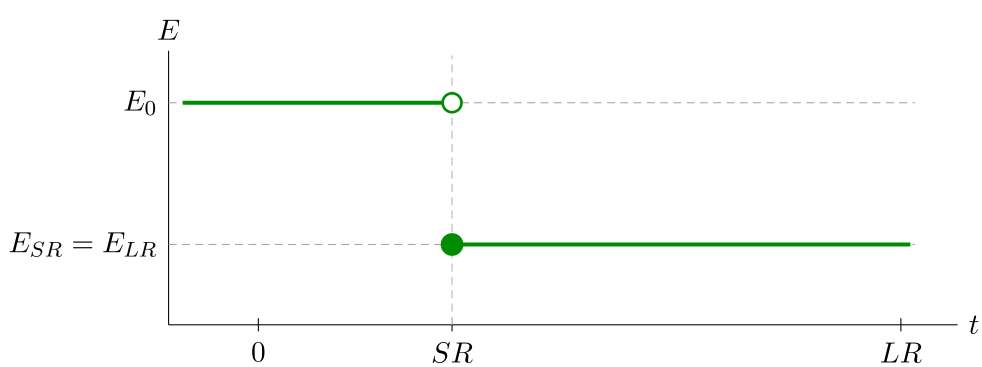
So

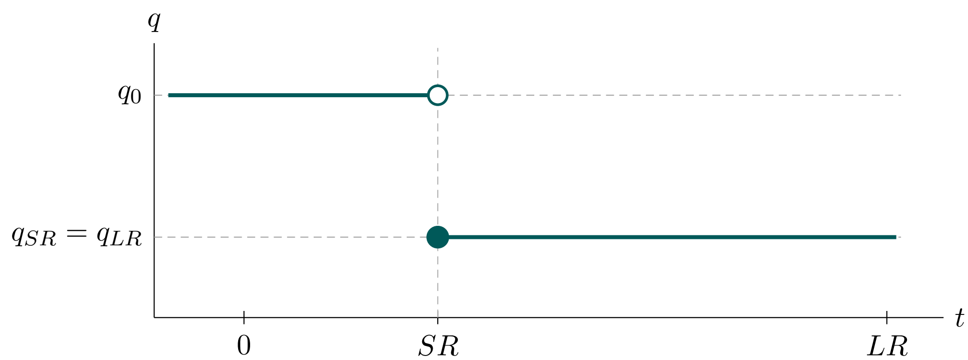
$$CA_{SR} = CA_{LR} = EX_{SR} - IM_{SR} = \frac{1}{10} = 0.100.$$

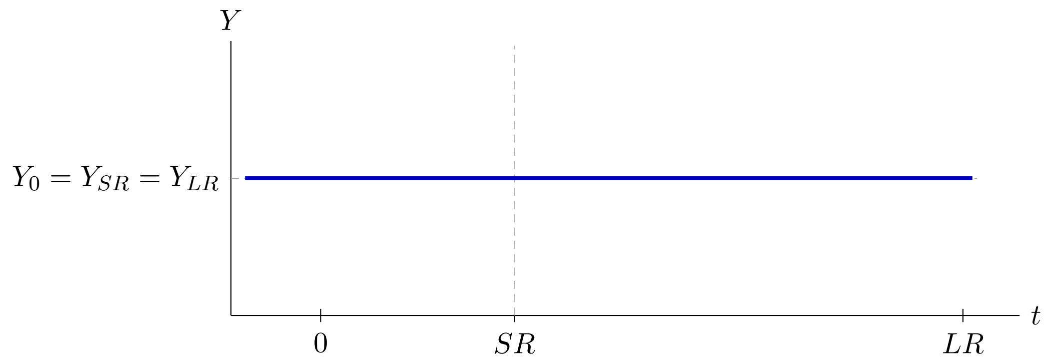
A convenient summary table is

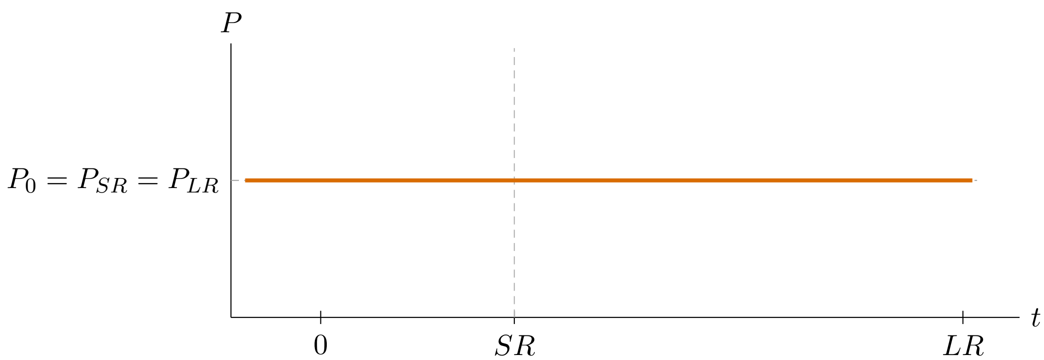
Variable	0	SR	LR
E	1.000	0.5625	0.5625
q	1.000	0.5625	0.5625
Y	1.000	1.000	1.000
P	1.000	1.000	1.000
π	0.000	0.000	0.000
CA	0.100	0.100	0.100
EX	0.350	0.306	0.306
IM	0.250	0.206	0.206

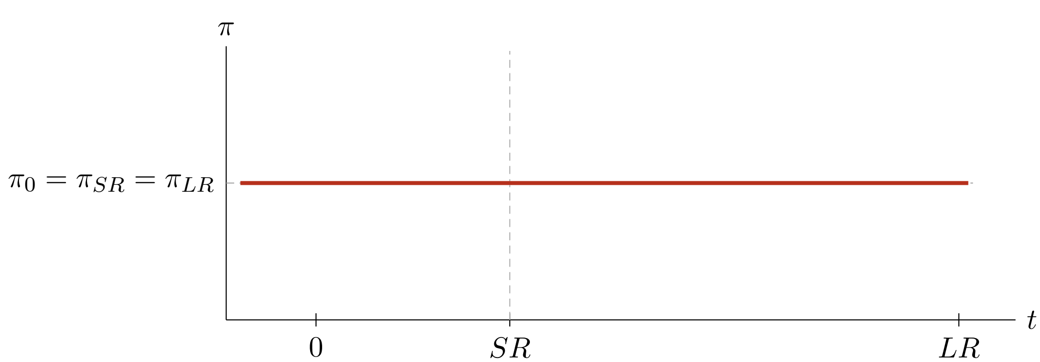
A correct set of time paths is shown below. Because the permanent tariff moves the economy directly to the new long-run equilibrium, every path is flat after the impact jump at SR.

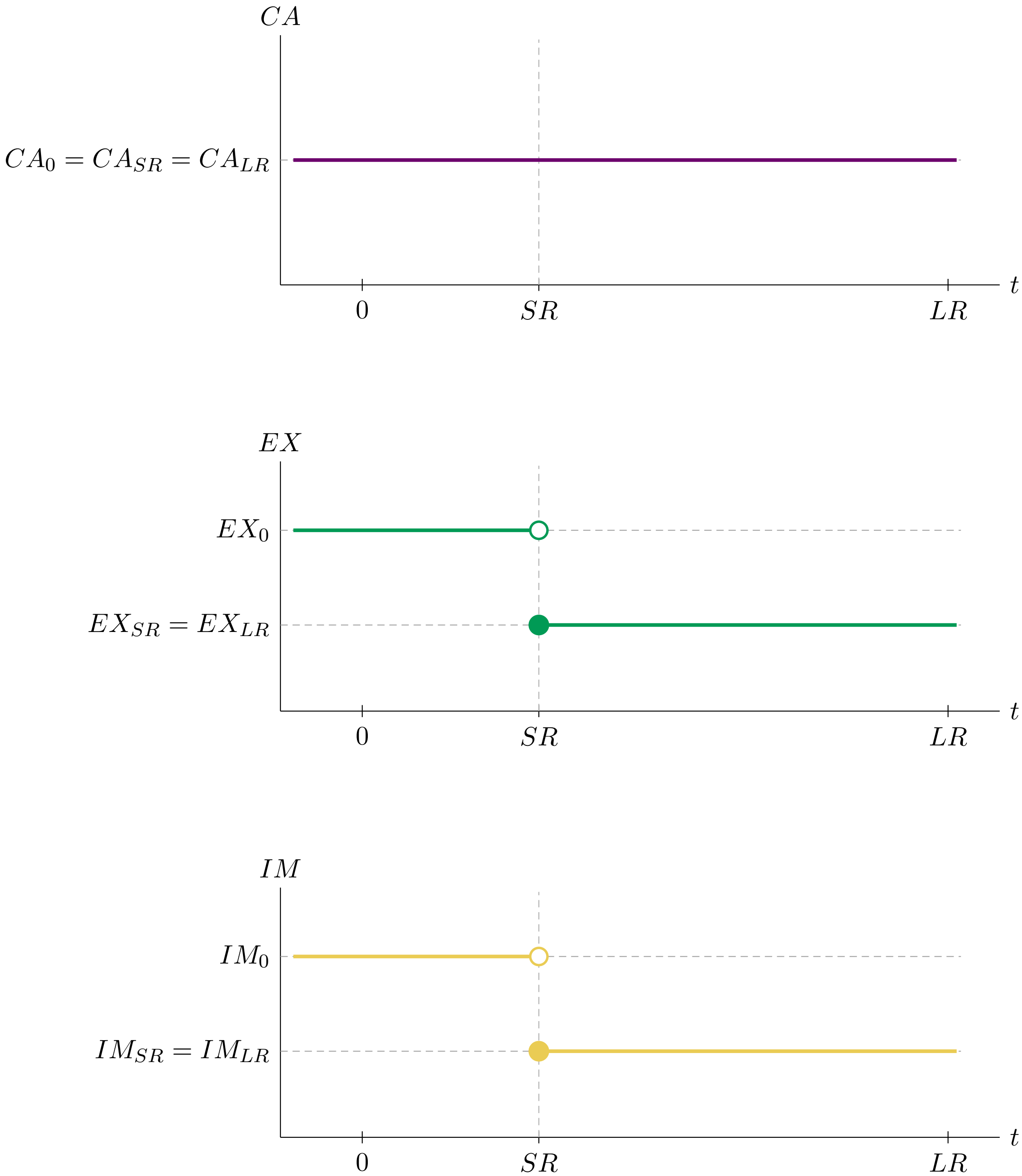



q
q_0
$q_{SR} = q_{LR}$
0
SR
LR
t


Y
$Y_0 = Y_{SR} = Y_{LR}$
0
SR
LR
t


P
$P_0 = P_{SR} = P_{LR}$
0
SR
LR
t


π
$\pi_0 = \pi_{SR} = \pi_{LR}$
0
SR
LR
t



The reason CA does not change is that the permanent appreciation offsets the expenditure-switching effect of the tariff. The tariff reduces imports, but the appreciation also reduces exports by exactly enough to leave the current account unchanged in this numerical example.