Macroeconomics I: Macroeconomic Principles
Midterm Exam
Long Question 1: debt overhang (25% of grade)

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1 Part a)

Consider the following IS-TR model:

$$\begin{aligned} Y &= 3 + G - i - \alpha (B - P) \\ i &= \bar{\imath} - 4 + P + Y \end{aligned}$$

where Y is output, i is the interest rate, G is government spending (fiscal policy), $\bar{\imath}$ is the target interest rate of the central bank (monetary policy) supply and P is the price level. B denotes the debt held by agents, so $B - P$ is the real debt.

The last term in IS captures the drag on growth that occurs when agents' spending is constrained by their debt, which is the case when $\alpha > 0$. Think of the case of $\alpha = 0$ as normal times and $\alpha > 0$ as a "debt overhang" situation. From now, we consider that $B = 3$.

The parametrization of IS-TR ensures that in the initial situation where $G = \bar{\imath} = 0$ and $P = 3$, both curves cross at $Y = 2$ and $i = 1$ regardless of the value of α.

Draw the aggregate demand line AD for two cases: a normal time case where $\alpha = 0$ and an overhang case where $\alpha = 2$. What is the intuitive explanation for the slope of the aggregate demand?

Answer: The solution of the IS-TR system is:

$$\begin{aligned} Y &= \frac{G-\bar{\imath}}{2} + \frac{7-3\alpha}{2} + \frac{\alpha-1}{2}P \\ i &= \frac{\bar{\imath}+G}{2} - \frac{1+3\alpha}{2} + \frac{1+\alpha}{2}P \end{aligned}$$

Regardless of α we get $Y = 2$ and $i = 1$ if $G = \bar{\imath} = 0$ and $P = 3$.

The solution for Y is the AD curve, which we rewrite as:

$$P = \frac{G-\bar{\imath}}{1-\alpha} + \frac{7-3\alpha}{1-\alpha} - \frac{2}{1-\alpha}Y$$

In the normal time case where $\alpha = 0$ the price is a decreasing function of output. A higher price is akin to a tighter monetary policy (higher $\bar{\imath}$ moving TR to the left), which lowers output. In the overhang case however the price is an increasing function of output. It is still true that a higher price is akin to a tighter monetary policy, but this is more than offset by a reduction of the real debt burden that boosts demand (a move of IS to the right).

The two versions of AD are drawn in figure 1.

2 Part b)

We now include an aggregate supply relation, with long-run output $\bar{Y} = 2$:

$$Y = \bar{Y} + (P - P^e)$$

where P^e is the expected price level. Draw the long and short run AS for $P^e = 3$.

Answer: The short run AS curve is:

$$P = \left(Y - \bar{Y}\right) + P^e = Y$$

It goes through the $P = 3$; $Y = 2$ point and as a slope of $+1$, which is flatter that AD when $\alpha = 2$. Figure 2 presents the AS and AD curves in the initial situation, with the equilibrium at point A.

3 Part c)

Consider a structural reform policy that increases the economy natural output $\bar{Y}$ to 3. Initially price expectations remain stuck at the initial level $P^e = 3$. What is the impact of the policy in the short run, and in the long run when expectations adjust?

What is the role of debt overhang? Explain the intuition.

Answer: The impact is shown in figure 3. The supply lines are initially at the dotted lines SRAS 0 and LRAS 0, with the equilibrium at point A.

The reform policy shifts both the LRAS and SRAS curves to the right to the solid lines LRAS1 and SRAS1.

Without debt overhang ($\alpha = 0$) we have an initial increase in output and price reduction, moving from point A to B1. Expectations ultimately catch on and we get the long run equilibrium at C1 with higher output (the corresponding SRAS is not drawn for clarity).

With debt overhang ($\alpha = 2$) we have a contraction to B2. Intuitively, the supply reform tends to lower the price level. Whereas this stimulates demand normally, it actually depresses it under debt overhang as it raises the real value of debt. In the long run we converge to the higher output at point C2.

4 Part d)

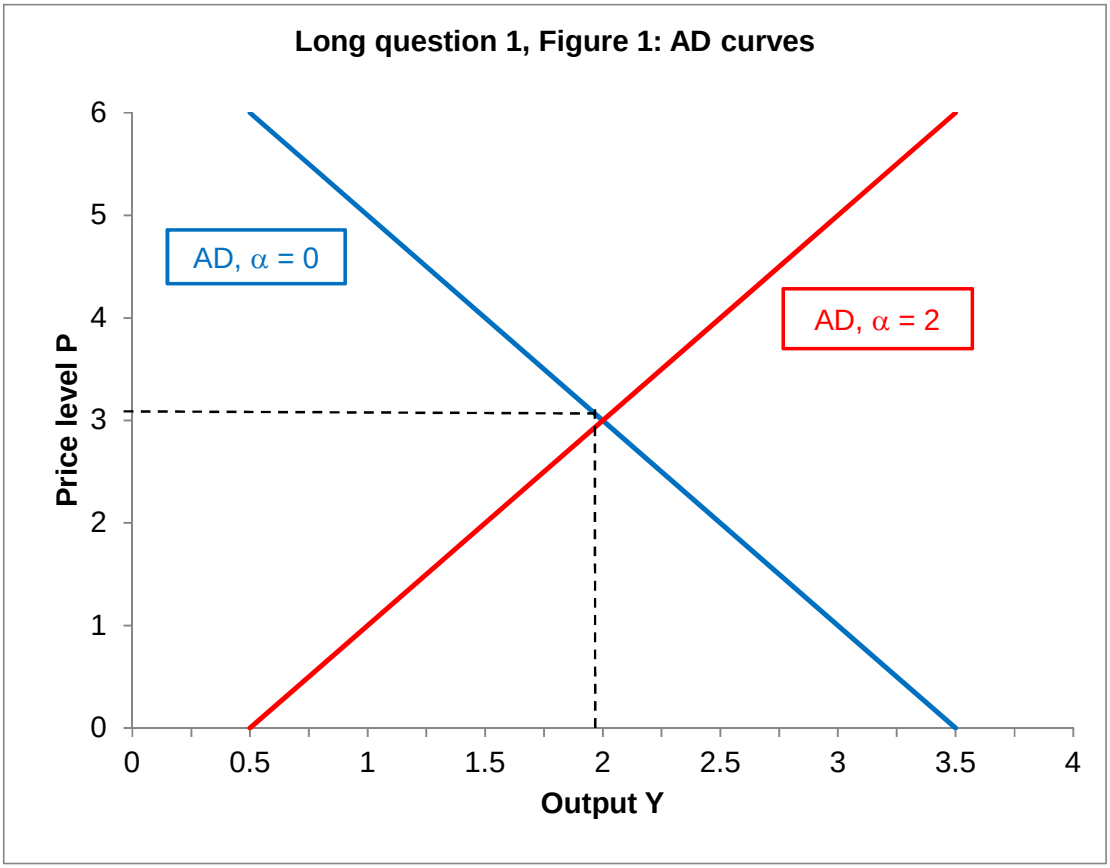
Consider that we are in the overhang situation ($\alpha = 2$). A structural reform, as considered in point c), is necessary. Can you think of a short term policy that could facilitate it?

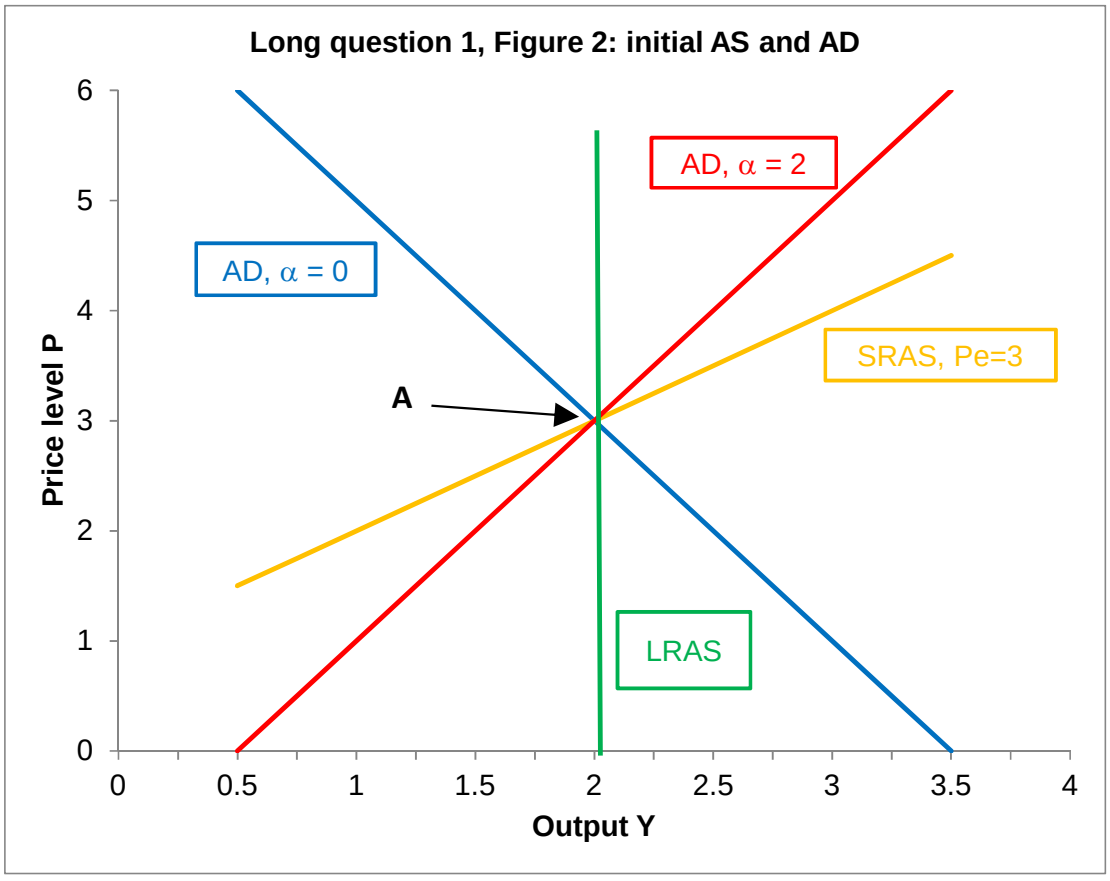
Answer: A demand expansion policy can help in the short run. Consider the impact of a fiscal expansion ($G > 0$)

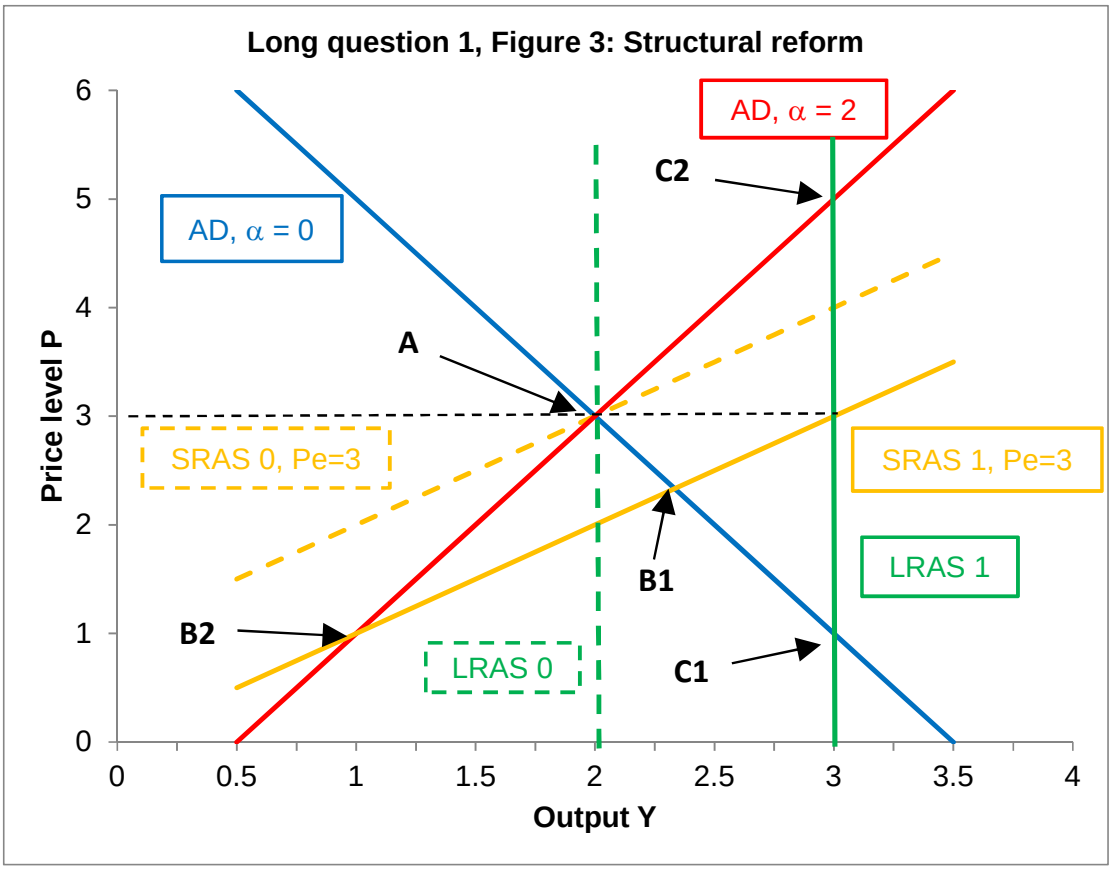
The impact is shown in figure 4. We are initially at point A. The structural reform shifts the supply curves to LRAS 1 and SRAS 1.

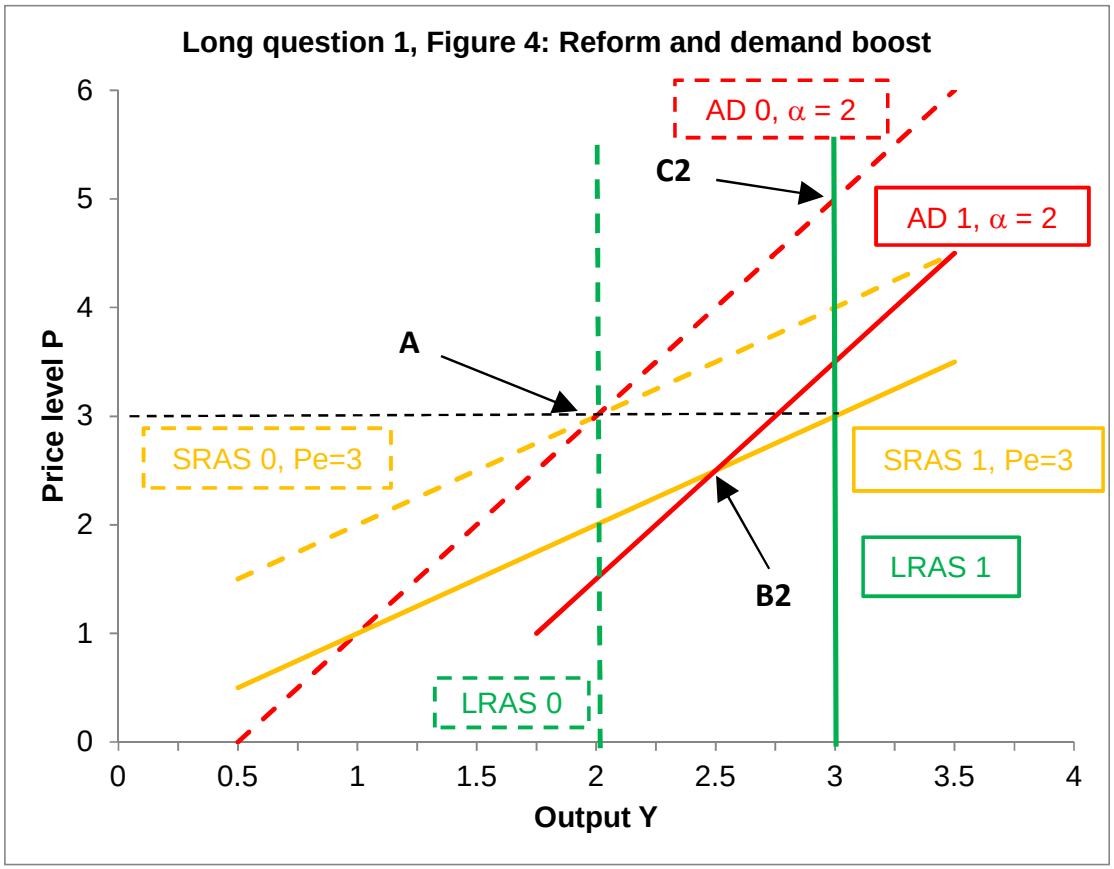
The expansionary fiscal policy shifts the AD curves now shift to the right to AD1. The new short-run equilibrium is at the point B2 with an increase in output. The short-run demand support therefore allows the economy to take full benefit from the reform without going first through a recession.

While the demand support would also help in the normal time ($\alpha = 0$) the difference is less drastic as we anyway get an output increase.


Long question 1, Figure 1: AD curves
Price level P
Output Y
AD, α = 0
AD, α = 2
0
1
2
3
4
5
6
0
0.5
1
1.5
2
2.5
3
3.5
4


Long question 1, Figure 2: initial AS and AD
Price level P
Output Y
AD, α = 2
AD, α = 0
SRAS, Pe=3
A
LRAS
0
1
2
3
4
5
6
0
0.5
1
1.5
2
2.5
3
3.5
4


Long question 1, Figure 3: Structural reform
AD, α = 2
C2
AD, α = 0
A
SRAS 0, Pe=3
SRAS 1, Pe=3
LRAS 1
B1
B2
LRAS 0
C1
Price level P
Output Y
0
1
2
3
4
5
6
0
0.5
1
1.5
2
2.5
3
3.5
4


Long question 1, Figure 4: Reform and demand boost
AD 0, α = 2
C2
AD 1, α = 2
A
SRAS 0, Pe=3
SRAS 1, Pe=3
LRAS 1
B2
LRAS 0
Price level P
Output Y
0
1
2
3
4
5
6
0
0.5
1
1.5
2
2.5
3
3.5
4