

## 1. IS-LM- AS as a general equilibrium model (continues)

### The short-run AS

With flexible wages and prices changes in policy or other shocks cannot affect the current level of output if labour supply depends on the current real wage alone. Yet, deviations of output from its trend level take place (e.g. Thatcher recession in the UK, Volcker recession in the US).

Furthermore, with a vertical AS prices would be acyclical while in fact they are procyclical.

This provides evidence against a vertical AS, at least in the short run.

On the other hand, the stagflation of the 70s provides evidence against the existence of a permanent positive association between prices and output or employment.

“You cannot fool all the people all the time ”-type

Aggregate Supply

$$Y = \bar{Y} + f\left(\frac{P}{P^e}\right), \quad f' > 0 \quad (1)$$

Microfoundations (the list below is by no mean exhaustive):

1. Sticky wages (Keynesian)
2. Workers' misperception (Friedman, Phelps)
3. Sticky prices (New Keynesian)

The problem with the first two is that they imply countercyclical real wages while in reality these are acyclical or mildly procyclical. Also, the first one is inconsistent with rational workers and the second one loses importance in a world in which information is more and more readily available.

For this reason, we will concentrate on the latter one.

## Sticky prices

Firm's are monopolistic competitors (price-setters). As their product is differentiated from that of other firms they can raise prices without losing all their customers. They review prices infrequently, because changing prices entails so-called **menu costs** (printing a new catalogue, etc.).

Suppose the production function for firm  $i$  takes the form  $Y_i = L_i$  and workers labour supply is perfectly elastic at the real wage  $w/P = \omega$ . This implies a nominal marginal cost independent from the level of output and equal to  $MC = \omega P$ . The inverse demand for the firm product is given by  $P_i = Pf(Y_i)$ ; i.e. it is downward sloping but it shifts with the aggregate price level.

Figure 1 shows that, in the absence of menu costs a change in  $P$  does not affect the level of production as both the marginal cost and marginal revenue curve shifts up by the same amount. Even with imperfect competition equilibrium on the labour market is inde-

pendent from the price level.

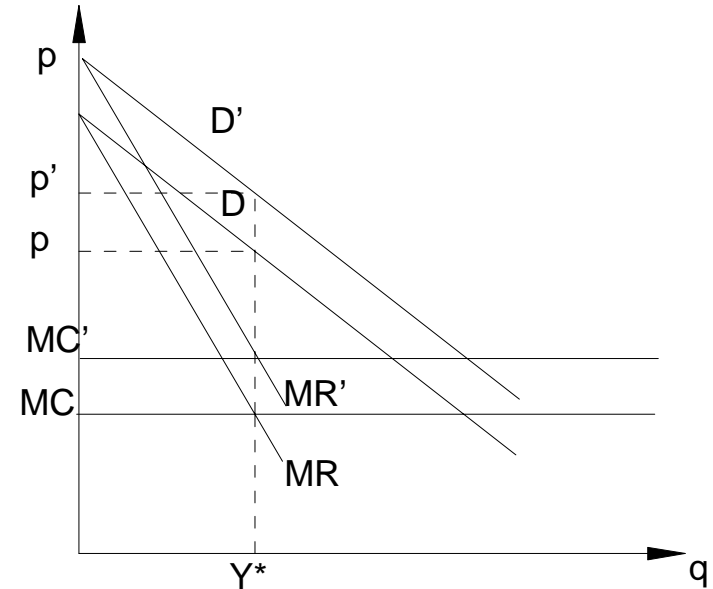


Figure 1

Suppose now that changing prices entails a fixed cost  $\kappa$ . Consider the effect on a firm's profits of not changing prices despite the increase in the aggregate price level. This is illustrated in figure 3. Since the firm charges the same prices it will now be able to sell  $Y' > Y^*$ . Notice

that it is profitable (though not optimal, absent menu costs) to do so as  $P_i$  exceeds  $MC'$ . By not changing its price the monopolist foregoes profits equal to the difference between the areas  $PP'AB$  and  $BCDE$ . If the foregone profits are smaller than the menu cost  $\kappa$ , it is optimal to leave the price unchanged.

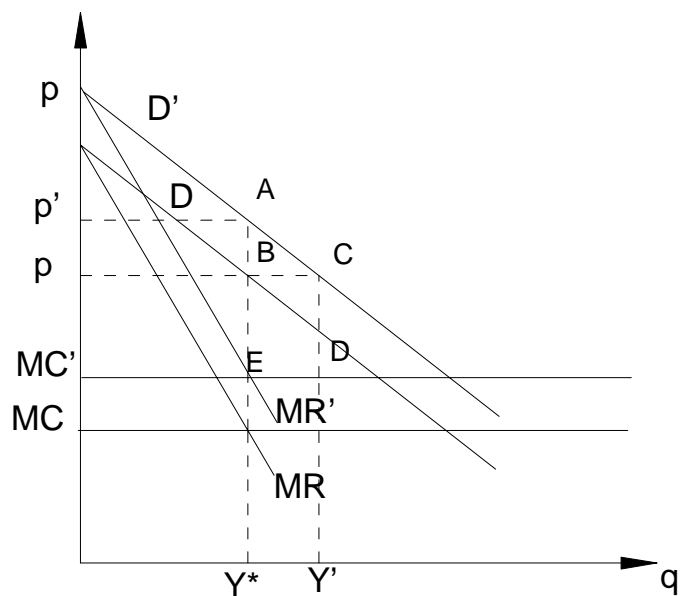


Figure 2

So menu costs provide a microfoundation for price stickiness. In our set up the real wage  $\omega$  is acyclical (consistent with the empirical evidence).

Assume now that for a proportion  $s$  of firms the menu costs exceeds profits foregone by not adjusting prices. Their price will be given by the price they set before the change in the aggregate price level; i.e.  $P_i = P^e$ .

Under slightly more general conditions than those we have assumed it can be proved that the  $1 - s$  firms that adjust their prices set them according to the following optimal pricing rule

$$P_i = P + a(Y_i - \bar{Y})$$

where  $\bar{Y}$  is the equilibrium level of production for the average firm in case all firms change their price,  $P$  is the average price and

The rule implies that production at an individual firm is higher than at the average firm if its price exceeds the average price.

The aggregate price level:

$$P = sP^e + (1 - s) [P + a(Y - \bar{Y})]$$

$$\text{SRAS: } P = P^e + [a(1 - s)/s] (Y - \bar{Y})$$

The SRAS is upward sloping. Its slope is increasing in the proportion of firms that adjust prices.

How large are menu costs? Likely to be small.

Yet, small menu costs can have large effect on output when firms are price setters. Price setting behaviour implies that prices maximize profits; i.e. marginal profits are zero. But, as shown in figure 3, if marginal profits are zero the first-order effect on profits of not changing prices is small for small enough changes in the aggregate price level (by the envelope theorem). So, small menu costs may have significant effects. On the other hand, menu costs are unlikely to explain why prices are sticky in the face of major changes in aggregate demand (e.g. Great Depression).

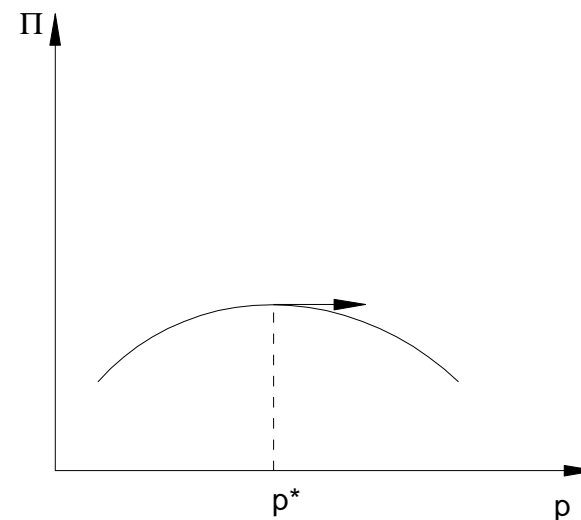


Figure 3

**Conclusion:** AD shocks can affect the level of output in the short run if there are nominal rigidities, but “you cannot fool all the people all the time”. For large enough changes in the aggregate price level, all firms would find it optimal to revise their price and produce the full employment level of output.