

### Price incentives model

1. The model below illustrates why, with a higher share of total capacity, the strategy for Knauf of maintaining British sales at levels below capacity is likely to become the most profitable strategy.
2. We normalized total capacity to 100 in the industry, and analyse the optimal strategy for Knauf with a 60 per cent or 80 per cent capacity share for the production of glass wool.
3. We assume that:
  - prices are 1 if there is sufficient capacity to more than supply the market, and 20 per cent higher if demand is constrained by the availability of supply. Since list prices of rolls and slabs have increased by some 30 per cent since demand exceeded capacity and these list price increases appear to have been transmitted in large part into increases of realized prices, we think it reasonable to assume that, in the excess demand regime, manufacturers can sustain prices 20 per cent above those prevailing in the excess supply regime; and
  - Knauf's competitors pre- and post-merger sell at their full capacity and are unable to sell above capacity, so that a reduction in output by Knauf gives rise to unmet demand and thus higher prices (we focus here on the unilateral effect on Knauf's revenues, costs, and profits of decreasing output below capacity in order to shift to the 'excess demand' prices).
  - Knauf does not have the option of selling some of its output overseas (but see paragraph 10 below)

## Revenue effects

4. Tables 1 and 2 illustrate the revenue effect of restricting output to varying extents below demand so as to benefit from the higher prices of the excess demand regime.

TABLE 1 Revenue effect of decreasing output with a 60 per cent share of capacity

*60% capacity share*

Knauf's output	60	55	50	45	40
Total output in the market	100	95	90	85	80
Knauf's revenue if sufficient supply	60	55	50	45	40
Knauf's revenue if excess demand	72	66	60	54	48
% increase in revenue from restricting output, compared to full capacity utilization		10	0	-10	-20

Source: CC.

TABLE 2 Revenue effect of decreasing output with a 80 per cent share of capacity

*80% capacity share*

Knauf's output	80	75	70	65	60
Total output in the market	100	95	90	85	80
Knauf's revenue if sufficient supply	80	75	70	65	60
Knauf's revenue if excess demand	96	90	84	78	72
% increase in revenue from restricting output, compared to full capacity utilization		13	5	-3	-10

Source: CC.

5. This shows that, up to a certain level, while revenue increases with reduced output both with a 60 per cent and an 80 per cent share, the revenue effect of decreasing output is stronger with a larger market share. Indeed, whatever the decrease in total output necessary in order to shift the market into the excess demand regime, the percentage increase in revenue is larger if Knauf has an 80 per cent share of capacity than if Knauf has a 60 per cent share of capacity. For instance, if total output needs to be 10 per cent below total capacity in order to shift to excess demand prices, Knauf's revenue increases by 5 per cent with an 80 per cent share, but not at all with a 60 per cent share. The explanation for this is that, with a larger share of capacity, for the same sacrifice in output, the increased price is obtained over a larger volume of sales.

## Profitability effects

6. The revenue effects analysis makes no assumptions about the impact of a reduction in output on costs. In order to assess the profitability of restricting output below capacity, we need to know how costs would change in response to a decrease in output.
7. We assume that:
  - at full capacity, costs are 60 per cent fixed and 40 per cent variable. Indeed, Knauf told us that at their current high levels of capacity utilization, costs were [X] per cent fixed and [X] per cent variable at Ravenhead, and [X] per cent fixed, [X] per cent variable at Pontyfelin.
  - when Knauf produces at full capacity, total costs are 70 with an 80 per cent capacity share and 52.5 with a 60 per cent capacity share (so that profit margins are the same in both cases at full capacity). This is equivalent to assuming that Knauf acquires 20 more units of capacity by acquiring a new plant with capacity of 20 and with exactly the same cost structure (60 per cent fixed costs and 40 per cent variable costs at capacity) than its previous plant.
8. Tables 3 and 4 show that unilaterally restricting output in order to benefit from the higher prices of the excess demand regime can be profitable with a 60 per cent capacity share as with an 80 per cent capacity share, but it is always more profitable for a manufacturer with an 80 per cent capacity share than with a 60 per cent capacity share.
9. For instance, if a decrease of total output by 10 per cent is sufficient to shift into the excess demand regime, in this example, Knauf will find it profitable to restrict output both with a capacity share of 60 per cent and 80 per cent. However, if a decrease of total output by 15 per cent is necessary, Knauf will prefer to sell at capacity with a 60

per cent capacity share, but will prefer to restrict output with an 80 per cent capacity share.

TABLE 3 Profits from decreasing output below capacity with a 60 per cent capacity share

*60% capacity share*

Knauf's output	60	55	50	45	40
Total output in the market					
Knauf's revenue if sufficient supply	60	55	50	45	40
Knauf's revenue if excess demand	72	66	60	54	48
Costs	52.5	50.75	49	47.25	45.5
Profit with sufficient supply	7.5	4.25	1	-2.25	-5.5
Profit with excess demand	19.5	15.25	11	6.75	2.5
% increase in profits from restricting output, compared to full capacity profits		103	47	-10	-67

Source: CC.

TABLE 4 Profits from decreasing output below capacity with an 80 per cent capacity share

*80% capacity share*

Knauf's output	80	75	70	65	60
Total output in the market					
Knauf's revenue if sufficient supply	80	75	70	65	60
Knauf's revenue if excess demand	96	90	84	78	72
Costs	70	68.25	66.5	64.75	63
Profit with sufficient supply	10	6.75	3.5	0.25	-3
Profit with excess demand	26	21.75	17.5	13.25	9
% increase in profits from restricting output, compared to full capacity profits		118	75	33	-10

Source: CC.

10. As indicated in paragraph 3, we assumed in this analysis that exports were not possible, so all the reduction in output represented sales forgone. If it were in fact possible to produce nearer to full capacity and export some of the balance, both revenue (by the value of export sales) and profitability would of course be higher than in the analysis above.