

Agenda

Advancing economics in business

Constrained by capacity or competition? Capacity constraints in merger analysis

How do capacity constraints of merging parties affect how those parties set prices, and what impact does this have on the price effect of a merger? A recent publication by Oxera economist, Bertram Neurohr, shows how merger analysis can change when capacity constraints are taken into account

Over the past ten years, competition authorities have increasingly used simple price-rise tests when assessing the impact of mergers between competitors. The most commonly used tests are the gross upward pricing pressure index (GUPPI), which is used in the USA as well as in Europe, and the illustrative price rise (IPR) test, which has been used predominantly in the UK.¹ Indeed, these tests are now well established in merger assessments in markets characterised by a degree of product differentiation. They have been used, for example, in mergers in grocery retailing, fast-moving consumer goods (FMCG), online retailing, and mobile telecommunications.

One of the main reasons for the popularity of these tests is their flexibility in accounting for key market characteristics that affect pricing incentives with relatively limited data. For example, in addition to the conventional GUPPI test, there are extensions for mergers where product quality plays a significant role, vertical mergers, and mergers involving partial equity stakes.²

Another market feature that is recognised as being particularly relevant for pricing, and therefore for merger analysis, is the presence of capacity constraints. In essence, capacity constraints can affect a merger assessment in two ways.

- First, if merging parties' rivals are capacity-constrained, they will be less of a competitive threat because they are less able to compete for additional sales. This is likely to increase the competition authority's concerns about the merger.
- Second, if the merging parties themselves are capacity-constrained pre-merger, so that the level of competition

between them is limited, the competition-reducing effect of the merger (due to the elimination of competition between the merging firms) is also limited. This is likely to reduce the competition authority's concerns.

Therefore, while capacity constraints of rivals are likely to exacerbate merger effects, capacity constraints of the merging firms themselves are likely to mitigate them. These factors were raised by the merging parties in the Pure Gym/The Gym merger before the UK Competition and Markets Authority (CMA) in 2014.³

So, how do capacity constraints affect these price-rise measures? This article discusses how the conventional GUPPI formula can be adapted to account for the capacity constraints of merging parties.⁴ While the approach proposed by Neurohr is more sophisticated than the conventional GUPPI, it remains simple and intuitive and has limited additional data requirements.

This extension does not account for rivals' capacity constraints, as the GUPPI focuses on the loss of competition between the merging firms only. However, this factor is typically taken into account in merger assessments in a qualitative manner.⁵

It is also important to bear in mind that firms may be willing to invest in capacity, so that capacity constraints will not be binding in the longer run.⁶ In such cases it will be relevant to consider whether, and to what extent, capacity constraints can be removed within the timeframe considered by the competition authority. The possibility of capacity expansions within the relevant timeframe is outside the scope of this article.

GUPPI analysis without capacity constraints

In essence, the GUPPI is a measure of the merging parties' incentives to raise their prices post-merger due to the loss of competition between them. The simplest GUPPI measure, which assumes symmetry between firms, can be written as the product of the diversion ratio between the merging parties and the merging firms' margin, where the diversion ratio between merging parties measures the proportion of sales lost by one party that is captured by the other, and hence reflects the degree of competition between them (and thereby the loss in competition due to the merger):⁷

$$GUPPI = \text{Diversion ratio} \times \text{Margin}$$

The GUPPI for one merging party, firm A, is therefore a measure of the 'value of diverted sales' that A loses to the other party, B, following a price increase before the merger—which would limit firm A's incentive to raise its price before a merger. After the merger, some of these customers switch to the merging party and therefore cease to be lost, thus reducing the disincentive (or creating an incentive) to raise prices. The GUPPI measures this change in pricing incentives.

The box below illustrates the use of the GUPPI as a screening tool to help competition authorities distinguish between mergers of relatively 'low concern' and mergers that are to be 'flagged for further scrutiny'.

A GUPPI merger screen in the absence of capacity constraints

The GUPPI was initially developed as a screening tool for mergers that required further scrutiny. Consider an example where a competition authority uses a 5% threshold for the GUPPI to determine whether a merger is of concern (the actual threshold will vary depending on the case and the authority).¹ The figure below shows different combinations of diversion ratios² and margins, and different regions given by the GUPPI merger screen.

The curve represents the set of margin/diversion ratio pairs where the GUPPI is equal to 5%. For margin/diversion ratio pairs below this curve, the GUPPI is below 5%, and a competition authority that uses the 5% threshold would categorise the merger as 'low concern'. Above the curve, where the GUPPI is above 5%, a competition authority that uses the 5% threshold would flag the merger for further scrutiny. Point x denotes a merger that is flagged for further scrutiny, while point y denotes a merger that is categorised as low concern.

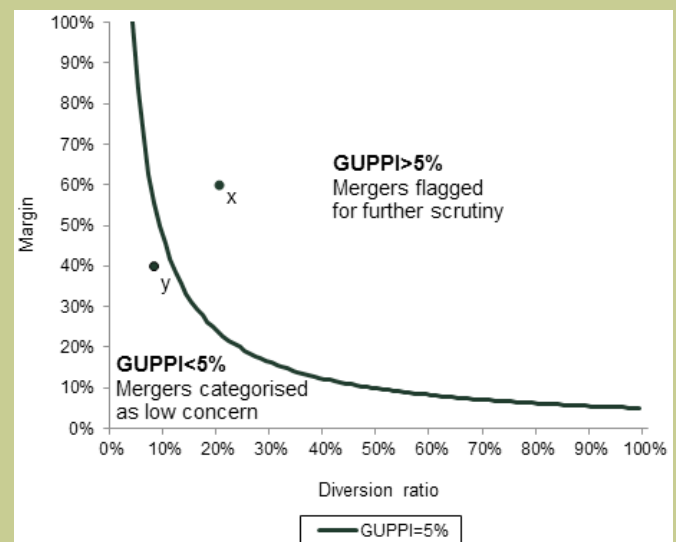
As illustrated in the figure, if either the margin or the diversion ratio between parties is very high, the merger is more likely to be 'flagged for further scrutiny'.

The impact of capacity constraints on prices

Before setting out the revised GUPPI, we use stylised examples to discuss how capacity constraints can affect the merging parties' price-setting. In particular, capacity constraints will prevent firms from reducing their prices to such an extent that they no longer have the capacity to meet the demand. In a merger context, it is also important to consider whether the capacity constraint is binding both before and after the merger. There are three possible cases:

- Case 1: a merging party is not capacity-constrained, either before or after the merger;
- Case 2: a merging party is capacity-constrained before the merger but not after the merger (i.e. as a result of the merger, the party raises prices and reduces output sufficiently for the capacity constraint to be no longer binding);⁸
- Case 3: a merging party is capacity-constrained both before and after the merger.

The figures overleaf illustrate the effect of a capacity constraint on a merging party's pre- and post-merger prices in the three cases.⁹



Note: ¹ In general, a competition authority can use a lower value if it wants to be more interventionist, and a higher value if it wants to be less interventionist. ² Diversion ratios measure the degree of switching, and hence substitutability, between products.

Source: Oxera.

Figure 1 illustrates the case of a merging firm that is not capacity-constrained, either before or after the merger. The firm simply sets its price to maximise profit both before and after the merger, and the elimination of competition between the merging parties means that its price is higher (and its output lower) post-merger. In this case, the capacity constraint is not binding and plays no role in determining pre- or post-merger prices.

In Case 2, where the merging party is only capacity-constrained pre-merger, it is prevented from setting 'too low' a price pre-merger, as it may not be able to meet the higher demand. This implies that its pre-merger price would be higher than in Case 1 (point A' instead of point A in Figure 2). The post-merger price, however, remains the same as before (at point B) because the capacity constraint is not binding post-merger. Hence, when the capacity constraint faced by the party is binding before but not after the merger, the price rise due to the merger is smaller.

In Case 3, where the merging party is capacity-constrained both pre- and post-merger, it sets its price such that demand equals capacity both before and after the merger. As illustrated in Figure 3, both the pre- and post-merger prices are set sufficiently high for demand to equal capacity, and the pre-merger equilibrium (A') is thus equal to the post-merger equilibrium (B'). The merger therefore has no effect on price or output, as the capacity constraint is binding both before and after the merger.

The above figures illustrate how the effect of a merger depends on the level of the capacity constraint relative to the level of the unconstrained pre- and post-merger outputs.

Implications for GUPPI analysis

As discussed above, if capacity constraints are binding they reduce the effect of a merger and, in extreme cases, can eliminate the merger effect altogether. This is because, if a firm's prices are (at least partly) determined by a capacity constraint rather than by competition, the effect of any reduction in competition due to the merger will be lower.

This intuition can be incorporated into the GUPPI to develop an adjusted GUPPI formula. As set out in the first box overleaf, the adjusted GUPPI is lower than the unadjusted GUPPI, which reflects the above intuition that a merger is likely to lead to smaller price increases if one of the merging parties is capacity-constrained.

This adjusted GUPPI measure is still based on a limited amount of data. In addition to the data on merging firms' diversion ratios and margins—which is also required for the conventional GUPPI measure—the adjusted GUPPI requires additional data only on customer sensitivity to changes in prices (i.e. the demand elasticity of the capacity-constrained merging party).¹⁰

The second box overleaf illustrates how using the adjusted GUPPI would change the results of a merger screen. In particular, mergers with certain diversion ratio and margin

Figure 1 Merger-specific price rise absent capacity constraints pre- and post-merger (Case 1)

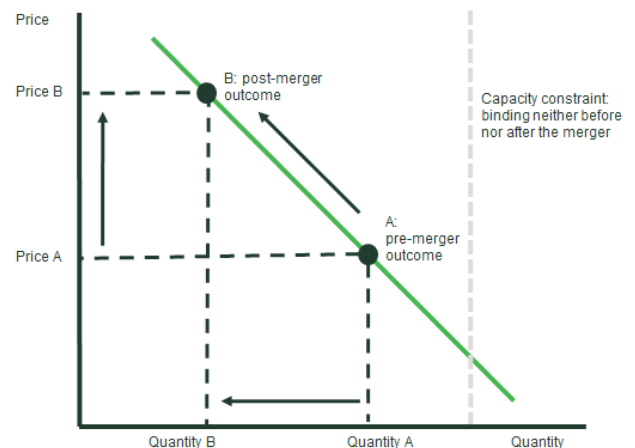


Figure 2 Price rise with capacity constraint pre-merger (Case 2)

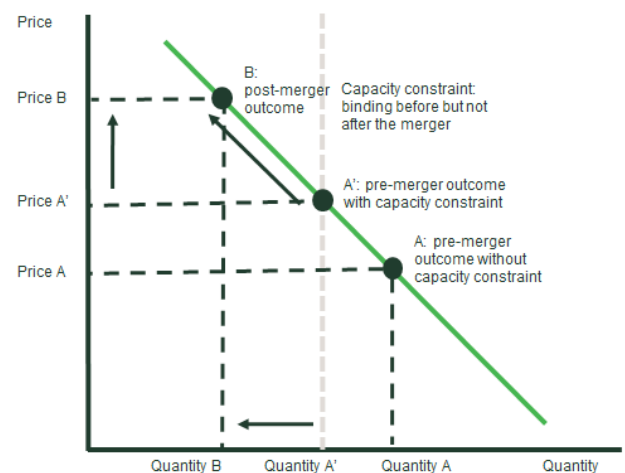
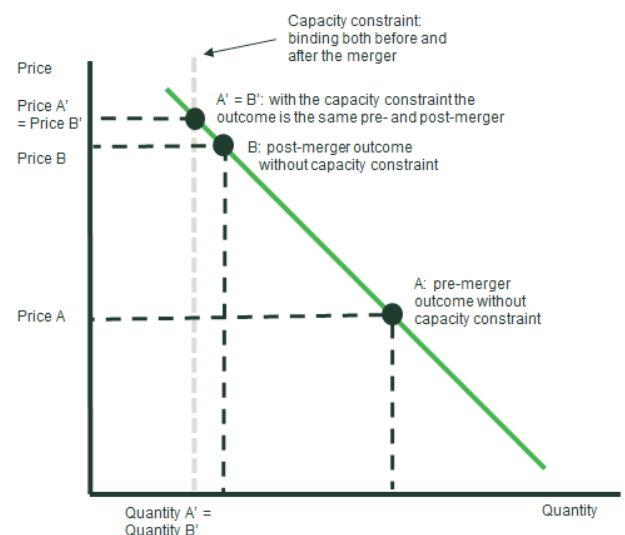


Figure 3 Price rise with capacity constraint pre- and post-merger (Case 3)



Source: Oxera.

GUPPI formula accounting for capacity constraints

Neurohr (2016) shows that the GUPPI can be adjusted to incorporate capacity constraints as follows:

$$\begin{aligned} \text{adjusted GUPPI} &= \text{GUPPI} \\ &\quad - (\text{actual margin of constrained firm before merger} \\ &\quad - \text{hypothetical unconstrained margin before merger}) \\ &= \text{GUPPI} - \left(\text{firm margin before merger} - \frac{1}{\text{firm elasticity of demand}} \right) \end{aligned}$$

As with the conventional GUPPI, the above adjustment is calculated using the actual pre-merger margin.

The extent of the reduction in the GUPPI is determined by the difference between the firm's actual pre-merger margin under the capacity constraint and the margin that it would have earned had there been no constraint. This in turn depends on the extent to which the capacity constraint prevents the firm from pricing at the unconstrained level. The unconstrained margin can be calculated using the Lerner condition.

The Lerner condition says that the unconstrained price is where the margin equals the inverse of the elasticity of demand.¹ The above expression thus states that, when the merging parties are capacity-constrained, the GUPPI needs to be adjusted to the extent that firm margins do not equal their unconstrained levels—i.e. to the extent that firm margins do not satisfy the Lerner condition.

The adjusted GUPPI above reflects that:

- in the absence of (binding) capacity constraints (i.e. Case 1), firms set their prices at the unconstrained level, so as to satisfy the Lerner condition, which in turn implies that the adjustment term is zero, leading to the conventional GUPPI measure;
- when capacity constraints are binding pre-merger only (Case 2), pre-merger prices are higher, and therefore the pre-merger margin is also higher. The adjustment term is therefore positive and the adjusted GUPPI is lower;
- when capacity constraints are binding before and after the merger (Case 3), the pre-merger margin is equal to the post-merger level. The bracketed term is therefore greater than or equal to the conventional GUPPI. In this case the above formula no longer applies, and the adjusted GUPPI is zero.²

Note: ¹ Elasticity of demand is a measure of the sensitivity of demand to changes in price. ² This is because the adjusted GUPPI formula is derived under the assumption that the capacity constraint is no longer binding post-merger. The formula can thus be stated slightly more precisely as:

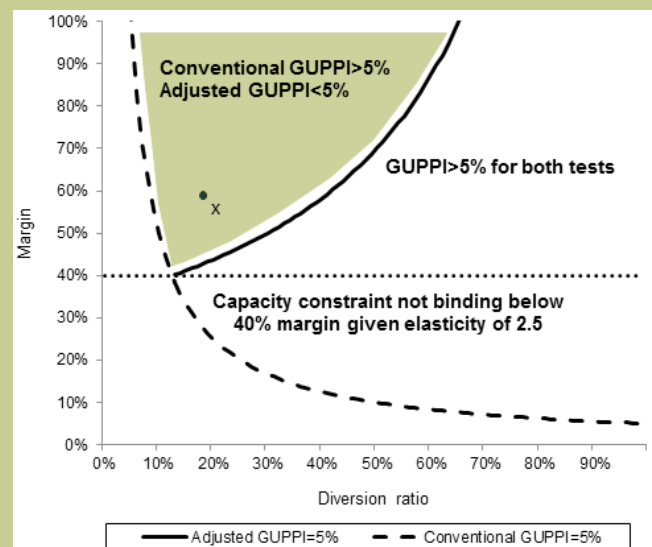
$$\begin{aligned} \text{adjusted GUPPI} &= \max \left\{ \text{GUPPI} \right. \\ &\quad \left. - \left(\text{firm margin} - \frac{1}{\text{firm elasticity of demand}} \right), 0 \right\} \end{aligned}$$

combinations (e.g. point x in the figure in the box) that were flagged for further scrutiny by the conventional GUPPI measure (which is above the assumed threshold of 5%).

GUPPI merger screen with binding capacity constraints

As with the assumptions in the first box, suppose that a competition authority uses the adjusted GUPPI as a merger screen, and a threshold of 5%, to identify mergers to flag for further scrutiny. The figure presents a comparison between the regions above and below the 5% threshold based on the GUPPI and adjusted GUPPI.

Comparison between merger screens using conventional GUPPI and adjusted GUPPI



Note: The above adjustment is based on a firm-specific elasticity of 2.5. This implies that the Lerner condition is violated for margins above 40% (= 1 ÷ 2.5). Margins below 40% are not consistent with a binding capacity constraint and an elasticity of 2.5. The case without a binding capacity constraint is discussed in the first box above.

Source: Oxera.

The curve based on the conventional GUPPI is the same as in the first box above, but is now indicated by a dashed black line. The curve based on the adjusted GUPPI is indicated by the solid black line and deviates from the conventional GUPPI curve to the extent that the margin exceeds the unconstrained level (given by the horizontal dotted line).

It follows that mergers that fall between the critical level for the conventional GUPPI and the critical level for the adjusted GUPPI would be flagged for further scrutiny by the conventional formula, but not by the adjusted formula. This is the case, for example, for a merger that lies on point x.

With the conventional GUPPI, higher margins increase the value of diverted sales and thus make it more likely that a merger will be flagged for further scrutiny. With the adjusted GUPPI, this effect is dominated by an opposite effect: higher margins imply a stronger capacity constraint and hence a stronger downward adjustment of the GUPPI.

Concluding remarks

From an economic perspective, there are good reasons why mergers involving capacity-constrained parties may need to be treated with greater leniency than mergers without capacity constraints. The use of tools that do not account for this can lead to over-intervention by competition authorities.

The CMA's assessment in the Pure Gym/The Gym merger indicates that competition authorities do take such capacity effects into account. In this case, the merging parties argued that they operated at or close to capacity, and therefore posed only a limited competitive constraint on each other. While the CMA did not find the evidence convincing in this case, it accepted that capacity constraints may limit the ability of firms to compete, and thereby the likely merger effect.¹¹

The adjusted GUPPI proposed by Neurohr (2016) is a step towards ensuring that this effect is accounted for in merger assessments in a rigorous yet simple and intuitive way. As with any theoretical analysis, care needs to be taken when applying it to concrete cases. For example, there might be reasons other than capacity constraints why the Lerner condition is not satisfied, including sticky prices, cost measurement errors, and the dynamic or multi-sided nature of some markets. Nevertheless, the economic intuition underlying the analysis is likely to hold in many markets that are known to involve capacity constraints. This adjustment therefore provides a useful addition to the GUPPI framework and can be used in conjunction with other tools and market insights to more fully capture the competitive effects of mergers in such industries.

This article is based on Neurohr, B. (2016), 'Upward pricing pressure under capacity constraints, kinked demand and other cases of a constrained pre-merger equilibrium', *Economics Letters*, **139**, pp. 49–51.

¹ Previous *Agenda* articles on these merger tools and related topics include Oxera (2011), 'Unilateral effects analysis and market definition: substitutes in merger cases?', *Agenda*, June, www.oxera.com/Latest-Thinking/Agenda/2011/Unilateral-effects-analysis-and-market-definition.aspx; Oxera (2013), 'Soaps, groceries and app stores: extending merger price-rise analysis', *Agenda*, May, www.oxera.com/Latest-Thinking/Agenda/2013/Soaps,-groceries-and-app-stores-extending-merger.aspx; and Oxera (2013), 'Price pressure in UK merger control: a retrospective', *Agenda*, July, www.oxera.com/Latest-Thinking/Agenda/2013/Price-pressure-analysis-in-UK-merger-control-a-re.aspx.

² See Moresi, S. and Salop, S. (2012), 'vGUPPI: Scoring unilateral pricing incentives in vertical mergers', *Georgetown Business, Economics and Regulatory Law Research Paper No. 12-022*; Willig, R. (2011), 'Unilateral competitive effects of mergers: Upward pricing pressure, product quality, and other extensions', *Review of Industrial Organization*, **39**:1-2, pp. 19–38; and Affeldt, P., Filistrucchi, L. and Klein, T. (2013), 'Upward Pricing Pressure in Two-sided Markets', *The Economic Journal*, **123**:572, F505-F523.

³ See paragraphs 141 and 142 of Competition and Markets Authority (2014), 'Anticipated combination of Pure Gym Limited and The Gym Limited', 11 September.

⁴ Following Neurohr (2016), the article focuses on cases where one of the merging firms is capacity-constrained.

⁵ See paragraphs 32–34 of European Commission (2004), 'Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings', 2004/C 31/03, 5 February.

⁶ A capacity constraint is said to be 'binding' if the capacity that a firm would ideally like to produce exceeds the quantity that it has the capacity to produce.

⁷ Symmetric diversion ratios and margins are assumed here for simplicity. For a more general approach, see Neurohr (2016).

⁸ We do not assume here that the merger increases capacity. Rather, it is possible that the merged entity will set a price that is sufficiently high for demand to fall below capacity (since it faces less competition after the merger), meaning that the capacity constraint ceases to be binding.

⁹ Post-merger, the merging party is a division of the merged entity and the post-merger price is the price corresponding to the products of this division. The difference between the pre- and post-merger scenarios is that pre-merger a merging party sets its price to maximise only its own profits, while post-merger it sets its price to maximise the joint profits of both merging parties (or rather, of both divisions of the merged entity). In the figures, A and B denote the pre- and post-merger outcomes for any given merging party.

¹⁰ The extent to which the capacity constraint is binding is then given by the extent to which the margin exceeds the inverse demand elasticity. As discussed below, there may be other reasons why the Lerner condition might not hold, and this should be accounted for.

¹¹ See Competition and Markets Authority (2014), 'Anticipated combination of Pure Gym Limited and The Gym Limited', 11 September, paras 141 and 142.