

The development of targets for consumer savings arising from competition policy

Economic Discussion Paper 4

June 2002

Report prepared for the Office of Fair Trading

by Stephen Davies and Adrian Majumdar

PREFACE

This report was commissioned by the Office of Fair Trading (OFT) from Professor Stephen Davies of the Centre for Competition and Regulation of the University of East Anglia and Adrian Majumdar of the OFT and the Civil Aviation Authority.

They were asked to suggest an appropriate methodology for quantifying the benefits to consumers that arise from the competition policy work of the OFT. They were asked to review the relevant academic literatures and the practice of the US competition authorities, which already seek to assess such benefits.

The views expressed and the recommendations made are those of the authors and do not necessarily reflect those of the OFT. The report is published by the OFT as a contribution to debate as to how the benefits of competition policy in the UK may be assessed.

This report is published within the OFT's Economic Discussion Paper Series, and is intended for discussion within a wide audience of practitioners and interested parties. If you would like to comment on the paper, please write to me, Amelia Fletcher, at the address below. If you would like extra copies of this report, please contact our mailing house whose details are on the back cover.

The OFT welcomes suggestions for future research topics on all aspects of UK Competition and Consumer Policy.

Dr Amelia Fletcher
Chief Economist
Office of Fair Trading
Fleetbank House
2-6 Salisbury Square
London EC4Y 8JX

amelia.fletcher@oft.gsi.gov.uk

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Authors of the report

Professor Stephen Davies

Centre for Competition and Regulation, University of East Anglia

Adrian Majumdar

Office of Fair Trading and Civil Aviation Authority

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CONTENTS

<i>Chapter</i>		<i>Page</i>
	Executive Summary	1
PART I: GROUND CLEARING		
1	Introduction	9
	Background to the OFT's Consumer Saving Targets	9
	Contract Details	10
	Layout of the report	11
2	Defining consumer savings	13
	Introduction	13
	The simple arithmetic answer (SAA) and Consumer Surplus	13
	Are we really only concerned with consumers: which welfare standard?	17
	How to treat costs	19
	Other 'indirect effects'	21
	Conclusions	23
PART II: LITERATURE SURVEYS		
3	The traditional literature on monopoly deadweight loss	25
	Introduction	25
	Historical overview of the literature	25
	Lessons to be learned from the basic methodologies used	27
	Allowing for oligopoly	30
	A speculative estimate of contemporary UK welfare loss	31
	Lessons to be learned about the "indirect" effects	32
	Conclusions	33
4	Competition and efficiency	35
	Introduction: defining terms and setting out simple ideas	35
	The theoretical literature	38
	The empirical literature	46
	Conclusions	50
5	Cartels: by how much do they raise price, and how long do they last?	52
	Introduction	52
	By how much can cartels increase price?	52
	Probability of detection and duration of cartels	66
	Summary and concluding comments	67

PART III: A PROPOSED APPROACH TO MERGERS

6	The US Approach to Quantifying Potential Price Rises in Merger Cases	69
	Introduction	69
	Starting point	70
	Precise estimates using detailed case-specific data	72
	A review of the recent academic (industrial organisation) literature	73
	The simulation methodology	82
	A back of the envelope equivalent	86
	Conclusions	90
	Endnote 1 to Chapter 6: how do the 1 percent default estimates relate to the SSNIP test?	92
	Endnote 2 to Chapter 6: unilateral versus coordinated effects in a simple model	96
	Endnote 3 to Chapter 6: deriving Shapiro's formula	99
7	Quantifying price rises in UK horizontal merger cases	100
	Introduction	100
	The sample of cases	100
	Simulating the price effects (i) for a homogeneous product	101
	Simulating the price effects (ii) for a differentiated product	106
	The other cases	114
	The scope for providing an aggregate estimate of consumer savings	117
	Conclusions	122
	Endnote 1 to Chapter 7: Tomkins plc and Kerry Group plc	124
	Endnote 2 to Chapter 7: Thoughts on the deterrent effect in mergers cases	129

PART IV: PRELIMINARY DISCUSSION OF AN APPROACH TO NON-MERGER CASES

8	The deterrent effect with respect to cartels	135
	Introduction	135
	Theoretical approach to deterrence	136
	Empirical evidence on deterrence	137
	Estimating the magnitude of deterrence	142
	Summary and concluding comments	145
9	Preliminary view on consumer savings in non-merger cases	147
	Introduction	147
	Cartels	147
	Anti-competitive conduct	149
	Excessive prices	152
	Deterrence	154
	Conclusions	155

PART V: SUMMARY

10	Advice on estimating consumer savings for mergers: a summary	156
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REFERENCES	158
-------------------	------------

LIST OF FIGURES

FIGURE 2.1a	The consumer surplus saved from a blocked merger	15
FIGURE 2.1b	The gain in consumer surplus from removing an anticompetitive practice	15
FIGURE 2.2	The Williamsonian welfare trade-off	20
FIGURE 3.1	The deadweight welfare loss	27

LIST OF TABLES

TABLE 5.1	The effects of bid rigging cartels in school milk markets	54
TABLE 5.2	The effects of bid rigging cartels in other US industries	55
TABLE 5.3	Examples of international cartels prosecuted by the DoJ	64
TABLE 7.1	The sample cases	101
TABLE 7.2	The 30 leading beer brands in 1995/6	113
TABLE 7.3	Market shares of non-leading brands by firm	114
TABLE 7.4	Merger references to the Competition Commission (MMC)	121
TABLE 7.1.1	Estimated market shares, supply of flour	125
TABLE 7.1.2	Estimate of market shares in the free flour market	125

EXECUTIVE SUMMARY

Introduction

When this report was commissioned, the Office of Fair Trading (OFT) was due to have in place by March 2002¹ two quantified targets for consumer saving as a result of its work in the area of competition policy:

- To save consumers at least £*a* million over *b* years by taking action against anti-competitive non-merger agreements and conduct that would otherwise have increased prices
- To save consumers at least £*c* million over *d* years by taking action against anti-competitive UK mergers that would otherwise have increased prices.

In order to arrive at these targets, the OFT needed to have a methodology for **quantifying** these 'consumer savings'.

The purpose of this report is to suggest an appropriate methodology, drawing, in particular, on reviews of the relevant academic literatures, and on the experience of the US competition authorities, which have similar targets. We believe that it is possible to derive a *lower bound* aggregate annual figure for potential consumer savings, and we provide examples of how such an approach might be applied to blocked mergers in the UK. Such estimates are, however, inherently hazardous, given uncertainty about what are appropriate counterfactuals, and this is why a lower bound approach is prudent. A lower bound estimate of annual consumer savings could be compared with the annual budgets of the competition authorities to help assess the net worth of competition policy. However, the imprecision of the estimates means that they are not suitable for use as performance targets.

The OFT consumer savings targets are being revised in light of this report. The target relating to consumer savings has been revised such that the OFT will aim to generate savings whose expected net present value will exceed their costs.

¹ See the document 'The Government's Measures of Success: Output and Performance Analyses', published by H M Treasury in March 1999.

Part I: Ground clearing

The report is arranged in five parts. Part I sets the agenda providing, in Chapter 1, some background to the consumer savings targets and a description of the original aims of the research project. Following this, Chapter 2 considers how we should define consumer savings. A simple method of estimating the consumer saving from intervention in any particular case is to estimate what percentage price rise is likely to have been prevented (or what price fall is likely to be secured), and to multiply this by the aggregate turnover of the firms (or of the market) concerned. For example, if we expect an intervention to prevent a 10 percent price increase in a market with an annual turnover of £1bn, the consumer savings are estimated at approximately £100m per year. This is loosely equivalent to measuring how the intervention increases consumer surplus³.

Our focus is on the change in consumer surplus. We acknowledge that it is common, in the economics literature, also to include the change in producer surplus in the 'aggregate welfare' calculus – even if this surplus represents monopoly rent. However, we have not included an estimate of the change in profits here, since the targets are phrased in terms of savings to consumers.

Part II: Literature surveys

Part II of the report contains three literature reviews looking at deadweight welfare loss, competition and efficiency, and price fixing and cartels.

Deadweight welfare loss

Chapter 3 reviews the traditional and familiar literature on the social costs of monopoly, to see whether there are any robust conclusions which could help us in making a consumer savings estimate. We find the ground to be well-trodden but the literature is too broad-brush to be worth pursuing in much detail. Nevertheless, this chapter also clears useful ground by reminding us of some indirect effects of market power which are not fully accounted for in simple, static models of deadweight welfare loss. For example, estimates of the social cost of market power might increase if we allow for the possibility that there are knock-on effects into other markets. Market power may also have a detrimental effect on factors other than price that are valued by consumers, such as product range or quality. In theory, competition might be expected to lead to more variety, which will generally be beneficial where consumers

³ Strictly speaking, a calculation of the change in consumer surplus requires that we also know the price elasticity of demand. However, so long as market demand is not too elastic – as we might expect if there is a competition problem – then our approximation is reasonable.

have different tastes. The traditional literature also notes that market power might result in 'rent seeking', or wasteful expenditure that is used to raise or maintain entry barriers, which most deadweight welfare loss estimates typically fail to pick up.

Competition and efficiency

A related, but more general, issue is whether competition is good for productivity, cost efficiency and innovation. This is explored in Chapter 4, which provides a brief survey of the relevant theoretical and empirical literatures. Here, we move to a more dynamic setting where competition is not just confined to the extent of market competition at a point in time but also reflects the process of rivalry between firms over time. We suggest that the balance of both the theoretical and empirical literatures is probably in favour of competition.

This finding is important because, if competition has a positive effect on productivity growth and innovation over time, then it can generate significant gains to both producers and consumers through helping to promote the growth of the economy. Both the theory and empirical work suggest that these effects will be case specific and so no rule of thumb emerges that would be reasonable to apply on aggregate. Therefore, we do not attempt to include any estimates of these (potentially large) dynamic effects in our consumer savings estimates. This is again consistent with our preference for a lower bound approach.

Price fixing and cartels

Chapter 5 covers less familiar territory. It summarises the empirical literature on the extent to which cartels are able to raise price above the competitive level. Our motivation is to ascertain whether it is reasonable to adopt a rule of thumb, similar to that used by the US Department of Justice, that cartels lead to prices being at least 10 percent higher than they otherwise would have been. By drawing together evidence of US bid rigging cases, international price fixing cartels and recent cartel cases prosecuted by the US and EC competition authorities, we believe that this survey fills an important gap in the literature. We argue that, in general, albeit with exceptions, bid rigging leads to prices well in excess of 10 percent and sometimes in excess of 20 percent of competitive levels. While price fixing cases tend not to lead to higher prices as consistently as bid rigging cartels, when they do, the effects are often very large and well in excess of 10 percent. Therefore, 10 percent might reasonably be applied as a conservative estimate in bid rigging cases and in those price fixing cases where the industry structure favours cartel durability. We also note a few studies that provide a mix of anecdotal and quantitative evidence that cartels led to higher industry costs and can sow the seeds for tacit collusion in the future.

Part III: A proposed approach for mergers

Part III contains the analytical core of the report. It develops a suggested methodology for estimating the consumer savings from intervention in cases of horizontal mergers. Chapter 6 begins with an overview of the methods used by the US antitrust authorities to estimate the savings to consumers from their merger activity. In order to understand fully their methods, it is necessary to highlight the recent theoretical literatures on the equilibrium analysis of mergers, product differentiation, and the simulation of mergers.

Default estimate

First, we note that both the US Department of Justice and the US Federal Trade Commission employ a 1 percent default estimate, whereby if a merger is blocked on the grounds that it would lead to higher prices, then, absent more sophisticated estimates, a conservative estimate of the price rise is taken to be 1 percent. It has been suggested that this intuitively falls out of the hypothetical monopolist or SSNIP test approach to market definition – if a monopolist of the market could raise prices by at least 5 percent, then a firm with market power should be able to increase prices by at least 1 percent. However, we note that this result is not obviously grounded in theory, and so empirical data are needed to test its value as a lower bound.

Simulation

Second, we describe a standard theoretical model of competition in product markets where goods are identical ('homogenous') which shows that, under a wide range of plausible conditions, any horizontal merger between suppliers of the same good must lead to higher prices unless there are cost 'synergies' (ie efficiencies which lower the marginal cost of production for the merged firm). We then consider different models where products are 'differentiated' (ie substitutes but not identical). We note the trade-off in using a model that is easy to compute and work with and the restrictive assumptions that it may entail. In these theoretical models, in the absence of significant cost savings, mergers in differentiated product markets also increase price.

Third, we describe how simulation methods have been used to predict the magnitude of a price rise following a merger. Simulation requires three stages: choice of the appropriate theoretical model; calibration of the model's parameters (eg assumptions made about own and cross price elasticities of demand and price-cost margins); and then simulation of the post merger equilibrium. We point to a few empirical studies which have predicted price rises following mergers in excess (and occasionally well in excess) of 1 percent. This suggests that a 1 percent default estimate is suitable as a lower bound. However, we note that these models *always* predict a price rise where there are no synergies, and so caution that the analyst must be aware of how any assumptions made in the simulation may seriously bias the estimates.

For example, it is difficult to model new entry and supply side repositioning in simulation models, and, where this happens, it is likely that the price rise would be lower than the model predicts.

Rule of thumb estimates

Some recent and highly sophisticated simulations are discussed which typically have taken several months to complete. We note that such simulation requires not only a lot of time and expertise but also a very rich data set. In an ideal world, consumer savings estimates would be made with this level of sophistication. However, competition authorities would rarely have the available resources. We therefore consider in Chapter 6 whether simple rule of thumb estimates can be derived which serve as useful approximations to the more sophisticated simulations. In Chapter 7, we assess how such rules of thumb, derived from oligopoly theory, might be applied to some recent cases encountered by the Competition Commission in the UK. We derive a simple formula to calculate the price rise in a homogenous goods market and use this to simulate how a merger in the flour industry could have increased prices. We explain how our estimate is likely to be a lower bound because it does not take account of the possibility that smaller firms in the market were capacity constrained, and that, because the merger would have reduced the number of large firms in the market from three to two, possible co-ordinated effects might have arisen post merger. We then consider a proposed differentiated products merger in the beer industry, noting how a simple rule of thumb estimate takes us quite close to an estimate from a much more time-intensive and sophisticated model.

We are encouraged by these experiments which seem to show that relatively simple rules of thumb based on oligopoly models can, in just a matter of hours, yield predictions of a similar order of magnitude to two sophisticated studies which took far longer to carry out. While further wider experimentation is clearly necessary to test the robustness of this finding, we consider that these techniques offer the prospect for generating more theoretically sophisticated estimates than the simple 1 percent of turnover default, while still remaining within the lower bound framework. However, we note that all simulation models, however sophisticated, can be highly sensitive to the underlying assumptions (and data). This should always be borne in mind when making consumer savings estimates (or analysing estimates made by third parties).

We conclude that there is a hierarchy of methods for estimating consumer savings: sophisticated simulation; rules of thumb, based on simple oligopoly models; and a default estimate of 1 percent. We then consider how long the benefits of competition policy are likely to last. This must be a case specific issue and no generalisations can be made. We note that the US Federal Trade Commission adopts a two year rule of thumb. This is in part because barriers to entry are sometimes thought of as factors which would impede entry for at least a two year period and because,

where action is taken against a merger, entry barriers are most likely to exist. On the other hand, the US Department of Justice assumes that the consumer savings last for just one year. We note that an anti-competitive merger is likely to have price effects which endure beyond (and probably well beyond) one year, even if they diminish over time. Nevertheless, in the interests of our lower bound approach, we – perhaps too conservatively – suggest adopting the assumption that the adverse price effects only last for one year.

Application to horizontal mergers in the UK

We go on to discuss how this framework can be applied to horizontal mergers analysed by the competition authorities in the UK. This involves not just action taken by the OFT but also by the Competition Commission. The sample of cases should include those cases blocked by the Competition Commission and also those cases where the OFT has provided informal or confidential advice that a merger proposal if pursued would be referred. In the latter instance, the consumer savings estimate would have to be reduced to allow for the fact that the Competition Commission does not make adverse findings in 25-35 percent of cases referred.

We conclude Chapter 7 by arguing that the above approach would allow a lower bound estimate to be calculated for UK merger policy. It should not be overly time consuming to apply the approach to a sample of horizontal mergers over a two or three year period. While this should provide a relatively robust lower bound estimate for consumer savings from merger policy, we do not advocate that it be used as a performance target. Apart from the imprecise nature of the estimates, we note that in absolute terms, the size of the estimates is very sensitive to the relevant turnover of the merged firms. Since the sizes of mergers are driven by factors outside of the control of the authorities, consumer savings estimates may well be volatile from year to year. Furthermore, we would not advise establishing a target that would motivate the OFT to pursue only those mergers that take place in high turnover markets. This might undermine the demonstration effect of merger policy by encouraging firms in smaller sized markets to pursue anti-competitive mergers.

Part IV: Future developments

Part IV looks forward, beyond the brief set for this stage of the work. It includes two, rather different, chapters. Chapter 8 addresses the important, but underdeveloped, issue of the deterrent effect of competition policy. The probability that policy deters, as well as punishes, implies that any cautious approach to quantifying the pay-off from policy is almost bound to seriously underestimate its effects. If anything, the need for more work on deterrence has been accentuated by the 1998 Competition Act, which introduced a prohibitions based approach to UK competition policy, with the possibility of levying financial penalties. In theory, we would expect that deterrence modifies anti-competitive behaviour the most in cartel cases because firms that are

party to price fixing, market sharing and bid rigging cartels are most likely to be aware that they are infringing competition law. The deterrent effect should therefore lead to some cartels being abandoned completely and some cartels modifying behaviour (eg lowering prices somewhat) to reduce the risks of detection.

Empirical literature on deterrence

The empirical literature – which is all based on cartel investigations – points to the importance of a deterrent effect. While there are mixed results on the effect of deterrence in the same market in which firms have been indicted, survey evidence (and casual empiricism) suggests that a wider, more general, deterrence is important. There is evidence that private sector competition practitioners will often advise their clients not to proceed with certain forms of behaviour owing to the likelihood that they will infringe competition law.

Evidence for the US suggests that rooting out cartels in one industry may well lead to lower prices in similar industries, particularly where the previously indicted firms are also found in those industries. Having made an initial discovery of a cartel, this also suggests fruitful avenues for competition authorities to pursue – repeat offenders are relatively common. From a UK perspective, the introduction of the Restrictive Trade Practices Act in 1956 appears to have deterred anti-competitive agreements. Once it was established that the UK courts would take a tough stance against cartels, this led to several anti-competitive agreements being abandoned with the effect that price competition became more intense and industry costs fell.

These quite different approaches to addressing the deterrent effect all suggest that deterrence is very important in making cartel behaviour less pernicious – this undoubtedly has a large benefit for consumers, given that cartels often lead to price hikes well in excess of 10 percent. We also provide a simple model which speculates that the deterrent effect of anti-cartel policy could quite feasibly be as large as the typical price reductions achieved when indicting a cartel. However, we cannot robustly quantify the magnitude of the deterrent effect and so we simply note that, by not doing so, our estimates are *very much* a lower bound.

Consumer savings from preventing anti-competitive practices

Chapter 9 is much more broadly based and speculates on how far the methods we have suggested for mergers might have counterparts for non-merger anti-competitive practices. We suggest that a default estimate of 1 percent is highly likely to be defensible (and this is the approach taken by the US Department of Justice for non-merger, non cartel cases). We consider that in depth investigations by the OFT may well yield enough evidence to generate a sensible consumer savings estimate, as for example, previous Competition Commission enquiries have done in the recent New Motor Cars inquiry, and in other earlier investigations of excessive pricing.

Consumer savings estimates may naturally arise out of OFT work done to calculate the appropriate amount of a financial penalty for infringing the Competition Act 1998. Here the penalty imposed will in part be based on estimates of what the infringing parties gained from the infringement.

Part V: Summary

Finally, Chapter 10 brings together some proposals and possible next steps for deriving consumer savings estimates for successfully challenged horizontal mergers. A lower bound estimate for merger policy certainly looks feasible. We note that ongoing consumer savings estimates would require a more systematic collection of data by the OFT and would be best made at the time of the case, when the analyst has the relevant details to hand. In horizontal merger cases, for example, a standardised form could be established which the analyst has to complete, and which would then allow simple oligopoly simulations to be made. Indeed, on occasion, such models may complement other casework. Here, refining the rules of thumb and understanding their inherent biases would appear to be a most fruitful avenue for further work. However, we note that the consumer savings estimates could be volatile, being largely driven by the turnover of the merging firms in the relevant market (a factor outside of the control of the authorities). Furthermore, we advise against a target that would incentivise the OFT to focus only on the large turnover cases to the detriment of small turnover markets, where the deterrent effect may be important.

PART I: GROUND CLEARING

1 INTRODUCTION

Background to the OFT's consumer savings targets

- 1.1 In its Comprehensive Spending Review, which was completed in July 1998, the Government formulated and published new objectives for each department, and undertook to publish measurable targets for performance against these objectives. These targets were included in the Public Services Agreements (PSAs) published in December 1998 in the White Paper, 'Public Services for the Future: Modernisation, Reform, Accountability' (Cm 4181).
- 1.2 This White Paper was followed by 'The Government's Measures of Success: Output and Performance Analyses' (OPAs), published by H M Treasury in March 1999, which set out how the Government would measure success in delivering its objectives for better and more efficient services. In this document, the objective which related to the Competition Policy division at the OFT was: 'to make sure that competition works well in markets for goods and services so as to make business more efficient and benefit consumers.' According to the document, in April 2002, the OFT's performance against this objective would be measured and monitored according to the targets set out below.
- 1.3 The Office of Fair Trading (OFT) would have to have in place by March 2002 the following two quantified targets for consumer saving as a result of its work in the area of competition policy:
 - To save consumers at least £*a* million over *b* years by taking action against anti-competitive non-merger agreements and conduct that would otherwise have increased prices.
 - To save consumers at least £*c* million over *d* years by taking action against anti-competitive UK mergers that would otherwise have increased prices.
- 1.4 In order to arrive at these targets by March 2002, the OFT needed to have a methodology for *quantifying* the benefits that consumers are likely to receive as a result of action taken by the OFT against anti-competitive agreements and conduct and against anti-competitive mergers. The aim of this research

project is to suggest an appropriate methodology. The OFT consumer savings targets are being revised in light of this report. The aim will be to generate savings whose expected net present value will exceed their costs.

Contract details

- 1.5 The project was split up into three stages. At the end of each stage it was agreed that the OFT would review the results and assess whether there was any the need to continue with the next stage. This report is the outcome at the end of stage 1.
- 1.6 When devising the contract, the first stage sought to concentrate primarily on what could be learned from the relevant existing literature. In particular, it was noted that the Department of Justice (DoJ) and the Federal Trade Commission (FTC) in the US had consumer savings targets and that the most sophisticated treatment of consumer savings was in the field of mergers. It was also noted that where data were not available for sophisticated analysis, 'guesstimates' or rules of thumb might be useful in quantifying consumer savings in certain merger cases. Stage 1, therefore, sought to set out a methodology for quantifying consumer savings that could be used in UK merger cases.

Aims for stage 1

- 1.7 More specifically, the aims identified for stage 1, and where they are addressed in this report, are as follows:
 - Define what is to be meant by 'consumer savings', and thereby to set out the agenda of theoretical and empirical issues. (Chapter 2)
 - Provide a brief review of literature on traditional welfare loss estimates and on how competition affects efficiency. (Chapters 3 and 4)
 - Provide a brief sketch of the literature reporting evidence on price rises resulting from cartels. (Chapter 5)
 - Review and explain the 'US approach' to quantifying potential price rises following a merger. (Chapter 6)
 - Attempt to take the US approach a step further by application to UK cases. Assess the possibilities for analysing the data currently available for UK horizontal merger investigations and what extra information could usefully be recorded. (Chapter 7)
 - Discuss possible approaches to deal with the deterrent effect. (Chapter 8)

- Discuss possible extensions of the methodology for mergers to non-merger cases. (Chapter 9)

Aims for stages 2 and 3

- 1.8 The original plan was that stage 1 would map out the relevant issues, with stages 2 and 3 being used to develop those issues that the OFT wanted to focus on in detail. In this regard, this report has exceeded the original intentions by also considering the deterrent effect and the effect of cartels on prices in detail, and by including a chapter on non-merger cases.
- 1.9 In addition to refining the analysis of stage 1, stage 2 envisaged using the proposed methodology for mergers to hypothesise a lower bound range for consumer savings from action against anti-competitive mergers, making clear the explicit (and perhaps heroic!) assumptions made which allowed us to derive the estimate. Stage 2 also aimed to suggest how the methodology devised under stage 1 could be applied to non-merger cases (now partly addressed in this report as Chapter 9).
- 1.10 Under stage 3 we would hypothesise a lower bound range for what consumer savings may have been generated in the previous year by action taken against anti-competitive non-merger agreements and conduct, again making clear the explicit assumptions used in order to derive the estimate. Stage 3 was also envisaged as the point at which to consider how to take further the issues hardest to address such as deterrence (now covered in Chapters 7 and 8) and the effects of competition policy on non price factors such as quality and innovation.

Layout of the report

- 1.11 The report is arranged in five parts. Part I sets the agenda: following this introduction, Chapter 2 considers how we should define consumer savings. This involves decisions about ‘which welfare standard’ and how widely we should cast the net to include ‘indirect effects’ of antitrust intervention.
- 1.12 Part II presents three background literature surveys. Chapter 3 contemplates the traditional monopoly welfare loss literature, and asks ‘what can we learn which is of interest for present purposes?’ Chapter 4 provides a concise survey of the theoretical and empirical literatures on the effects of competition on efficiency and productivity. The intention here is to provide a perspective on the likely magnitudes of some of the indirect effects just mentioned. Chapter 5 summarises the academic literature on the extent to which cartels are able to raise price above the competitive level. Although this is of only

indirect relevance for the main emphasis of stage 1 (ie mergers), we believe that this survey fills an important gap in the literature, and will have a ground clearing function for later stages of the project.

- 1.13 Part III contains the analytical core of this stage of the project. Chapter 6 provides an overview of the methods used by the US antitrust authorities to estimate the savings to consumers from their merger activity. In fact, this chapter is quite wide ranging. In order to appreciate fully these methods, it is necessary to understand the main messages to come from the recent academic literatures on the equilibrium analysis of mergers, product differentiation, and the simulation of mergers. Much of the chapter is concerned with these literatures. In the light of the US approach, Chapter 7 sets out our proposed approach to quantifying savings in UK merger cases. Drawing on a sample of case studies, it explores how estimates might be derived in individual cases. It then goes on to discuss how an aggregate estimate might be derived for the total savings arising from all merger cases investigated in a given year. In brief, we conclude that it should be possible to generate approximate estimates in all cases – some with more accuracy than others. However, we advise against setting a target which is over dependent on the precision of these estimates. Instead, we advocate a ‘robust lower bound’ approach which uses conservative estimates that are not too dependent on the size-mix of cases coming before the OFT in any particular year. We also warn against imposing targets which might require that a certain number of ‘large’ (in turnover terms) cases would have to be investigated in order to meet those targets.
- 1.14 Part IV looks forward to the potential future stages of the work. Chapter 8 develops some ideas on how one might approach the deterrent effect with respect to cartels. Chapter 9 is more broadly based, and speculates on how far the methods we have suggested might have counterparts for non-merger anti-competitive practices.
- 1.15 Part V in Chapter 10 provides a brief closing summary, by bringing together some proposals and possible next steps for deriving consumer savings estimates for successfully challenged horizontal mergers.

2 DEFINING CONSUMER SAVINGS

Introduction

- 2.1 How should we define the consumer savings resulting from competition policy? This question begs a number of others – savings in what, by whom, and over what time period? To answer them, we will need to decide which ‘welfare standard’ to adopt, and how wide-reaching our research design should be.
- 2.2 First, we very simply define a superficially obvious, ‘simple arithmetic answer’ as the base line. We suggest that this is, in effect, an approximation to consumer surplus (albeit, as we shall show, an overestimate in the case of mergers and an underestimate for non-mergers). We thereby confront the big issue: are we interested only in consumer surplus, or does producer surplus also have a place in the story? Second, we argue that ‘the consumer welfare standard’ is appropriate in this context, although we accept that some flexibility is called for. Third, we move on to consider how to treat cost savings. Fourth, we itemise a series of indirect savings which might be attributable to intervention. Fifth, we briefly consider the time scale over which savings might be assumed. Sixth, we move on to discuss what stance we should take on the ‘correctness’ of decisions taken by OFT and the Competition Commission. Finally, we conclude by drawing out our main decisions.

The simple arithmetic answer (SAA) and consumer surplus

- 2.3 For the moment, we identify a very straightforward answer to the question:
- How much do consumers save from a particular instance of antitrust intervention?
- 2.4 Suppose it can be shown that the intervention leads to a reduction in price (or avoidance of an increase in price) of x percent, in a market with turnover of $\pounds y$. The intervention will save consumers an expenditure of $\pounds y.x/100$.

2.5 This is also implicit in the FTC's strategic plan 1997-2002⁴, concerning mergers.

The dollar volume of commerce in markets protected by the FTC's successful merger challenges is estimated to be \$24 billion in 1996. Using the most recent high-water mark of 1996, one can estimate that, if the FTC's successful merger challenges prevented price increases of just one percent of the \$24 billion of commerce in the markets protected by those challenges, then the FTC's merger challenges alone saved consumers \$240 million in 1996.

2.6 We shall refer to this as the **simple arithmetic answer (SAA)**. As can be seen, for merger cases it requires (i) an estimate of the total turnover in the market concerned⁵, and (ii) an assessment of the magnitude of the price increase avoided by the *merger challenge*. Analogously, in the case of intervention involving the *removal of an anti-competitive practice*⁶, we would need to assess the magnitude of the price reduction effected.

Example

2.7 The Competition Commission report (Cm 4660, April 2000) concluded that new car prices were about 10 percent too high. If the appropriate market is judged to be about £13 billion in 1998, then an order to the manufacturers to reduce prices accordingly would produce an SAA of £1.3 billion.

But what about the marginal consumers?

2.8 Although SAA is attractively simple, it does have an important limitation: it abstracts from the fact that *consumers will typically respond to a price reduction/increase*. To see the significance of this, consider first the case of a **merger** which would otherwise increase price from P_0 to P_1 . According to the above definition, the SAA from intervention is the rectangle, $P_1DA P_0$ in fig. 2.1(a).

⁴ <http://www.ftc.gov/opp/gpra/6strat5yrB.htm>

⁵ In some cases, as we shall discuss later, we might require only the turnovers of the parties to the merger, depending on the nature of the product, ie whether it is homogenous or differentiated, and, if the latter, the extent of differentiation.

⁶ Throughout, we will define this term to include all anti-competitive non-merger agreements and conduct that have a price increasing effect.

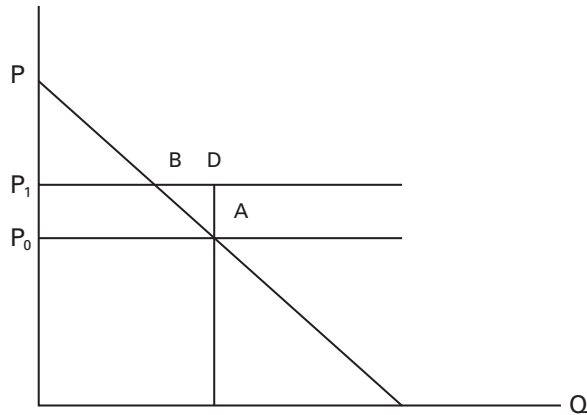


FIGURE 2.1a – THE CONSUMER SURPLUS SAVED FROM A BLOCKED MERGER

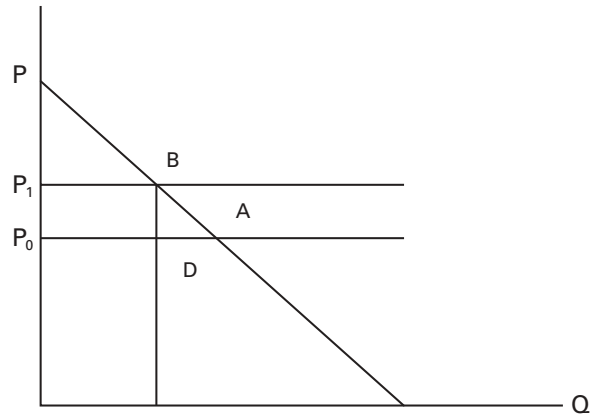


FIGURE 2.1b – THE GAIN IN CONSUMER SURPLUS FROM REMOVING AN ANTICOMPETITIVE PRACTICE

- 2.9 Notice, however, that SAA ignores the fact that the price increase would be incurred only by those consumers who would continue to consume the product after the merger. Assuming, as here, a downward sloping demand curve, some consumers would, of course, withdraw from the market as price increases⁷: in the figure, the volume of this exit is equal to the distance BD. Now, while these exiting consumers still lose out, it is misleading to equate their loss with the product of the price increase and their initial expenditure. In exiting from this market, they will substitute with expenditure on some other good, from which they will derive utility.
- 2.10 A similar effect occurs, but in reverse, in the case of removal of an anti-competitive practice, leading to a price reduction from P_1 to P_0 in figure 2.1(b). Here, SAA ($P_1BD P_0$) underestimates the gain to consumers because it records only the gains to existing consumers, this time ignoring the fact that some new consumers (DA) enter, now preferring this product to some other previously consumed.

⁷ For simplicity, this wording implies the case where each consumer buys, at most, one unit of the product. The wording, but not the essence of the argument, would be modified if consumers consume more than one unit and the price rise merely reduces the *number of units* they choose to consume.

Consumer surplus

- 2.11 In other words, by focusing exclusively on pre-intervention consumers, SAA provides only an approximation to total consumer gains or savings. Moreover, the nature of the approximation differs between a merger challenge and removal of an anti-competitive practice – overestimating and underestimating respectively the ‘savings’⁸.
- 2.12 This leads naturally to the thought that a better measure of ‘consumer savings’ would be the change in consumer surplus. For an increase in price from P_0 to P_1 , in figure 1(a), or a reduction from P_0 to P_1 in figure 1(b), this will be the trapezium P_1BAP_0 . In effect, while this includes the marginal consumers in the calculation, it weights their interests less highly than the remaining consumers, precisely because the comparison for them is between consuming and not consuming (ie buying some other product).
- 2.13 A simple bout of algebra serves to show how the change in consumer surplus compares with SAA for a simple linear demand curve. First, denote the proportionate overestimate of the gain in consumer surplus (CS) by SAA as:

$$\text{ERROR} = (\text{SAA} - \text{CS})/\text{SAA} \quad (2.1)$$

- 2.14 Geometrically, this is the area of the triangle BDA, divided by the rectangle $P_1DA P_0$, thus:

$$\text{ERROR} = 0.5 \times (\text{BD} \cdot \text{DA}) / (\text{P}_0\text{A} \cdot \text{DA}) = 0.5 \times \text{BD} / \text{P}_0\text{A} \quad (2.2)$$

- 2.15 Now, BD is the change in quantity, resulting from the price change, and P_0A is the initial quantity. Thus ERROR is equal to half of the proportionate change in quantity. Since the proportionate change in quantity is given, quite generally, by the proportionate change in price ($\Delta P/P$), multiplied by the (arc) demand elasticity, e , it follows that

$$\text{ERROR} = (e/2) \times (\Delta P/P) \quad (2.3)$$

⁸ The SAA is usually an overestimate in mergers. However, it would underestimate consumer surplus if a merger with a potential entrant is blocked because it would prevent a price fall (see Fresenius-Caremark, 1998, discussed in Chapter 7).

- 2.16 Using similar geometry, it is easily shown that SAA underestimates CS in figure 1(b) by the same percentage. To illustrate, consider again the new cars case: the 10 percent reduction in price would mean that our earlier estimate of SAA (£1.3 billion) would be an underestimate, by $0.05e$, of the gain in consumer surplus. With a demand elasticity of 1, this would imply an underestimate of 5 percent, although this would rise to 20 percent with, say, $e = 4$.

Beyond consumer surplus?

- 2.17 Although consumer surplus has a very obvious pedigree in this area, one might argue that there are conceptually better ways of interpreting 'savings' which may be interpreted more directly as gained 'utility' (or avoidance of lost utility), namely the compensating and/or equivalent variations. These concepts are based on the idea that we measure utility by the income consumers would require to compensate for a price increase, or the income they would be willing to pay to avoid a price increase. However, in spite of the greater theoretical elegance of such measures, we shall not pursue them here, partly because this adds an additional layer of conceptual complexity, partly because it would often raise operational difficulties, and partly because the expectation is that they would not generate substantively different estimates from consumer surplus.

Are we only concerned with consumers: which welfare standard?

- 2.18 Whether consumer savings are measured by either SAA or consumer surplus, this clearly ignores the welfare of producers⁹. Abstracting, for the moment, from the possibility that the intervention might lead to cost changes for the firms immediately involved, there are two points to be considered here.

'Monopoly' profits versus profits which promote innovation

- 2.19 First, and most obviously, where intervention leads to a reduced price (or prevents a price rise), this will be invariably at the expense of the profits of the firms concerned. Should we entirely ignore their loss in the welfare calculus? This brings us to the heart of an important issue concerning the role of competition authorities such as the OFT: as an instrument of antitrust policy, is the OFT concerned solely with the immediate interests of consumers? If the answer is yes, then the discussion ends here, and, superficially at least,

⁹ Another question, ignored here, is whether we wish to include savings for consumers outside UK. This may be just a trivial point about how to measure market size, but it becomes trickier if there is price discrimination.

this would appear to be the 'right' answer. After all, if the result of the intervention is to reduce monopoly profit, it would be perverse to suggest that this loss should be offset against the increased consumer surplus.

- 2.20 On the other hand, there will be circumstances when the welfare of producers *should* matter to consumers (and not just because some consumers are also shareholders). For example, what if profits can be interpreted as, say, the return on previous innovation, or as providing the funding for future innovation? This might suggest that producer surplus should not be discounted entirely, inasmuch as it generates future consumer surpluses.

Profits of 'third party' firms

- 2.21 The second point is a little more subtle. It concerns the profits of third party firms (ie those not party to the merger or the anti-competitive practice). The issues involved can be illustrated by considering two hypothetical cases. In case I, suppose that policy intervention removes or weakens a vertical restraint, and that this leads to the entry of new firms and, in turn, a lower price. In case II, intervention blocks a merger. Absent the intervention, the newly merged firm would have raised its prices, and, in response, its non-merging rivals would also have increased their prices. In both cases, the intervention has an indirect effect on the profits of third party firms, but should these be included in our welfare calculus? Intuition suggests that they perhaps should be in case I, since the profits of the newly entered firms are a reward for their competition-enhancing entry. But, in case II, it would seem strange, from an OFT perspective, to argue that a cost of the blocked merger is to deny third parties the chance to raise their prices because of a softening in price competition in the market.

Choice of welfare standard

- 2.22 In effect, the question amounts to one of which welfare standard should we apply? Is it simply the price standard (only consumer surplus is relevant), or is it aggregate welfare (the sum of consumer and producer surplus)? Inevitably, this requires a value judgement¹⁰.
- 2.23 On balance, our view is to stand by the price standard. There are two possible justifications for this stance. First, one might appeal, of course, to the nature of this particular research brief: after all, if we are to assess savings to the consumer, it is not unreasonable to argue that, for this purpose, 'the consumer is king'. In fact, our justification is a little less doctrinaire and more pragmatic

¹⁰ After all, the ultimate recipients of profits are shareholders, whose utility also presumably matters to society.

(perhaps the consumer is not quite an *absolute* monarch) and hence our second justification is as follows. Given that the origins of producer surplus are inevitably mixed (sometimes market power, sometimes reward for efficiency or innovation), to include the effects on producer surplus of intervention would not only increase the operational complexity of the present exercise, but also introduce an element of controversy¹¹. While there will be circumstances where profits *should* matter – even to policy makers whose primary concern is with competition policy – this is best recognised by case-by-case flexibility, rather than by routinely including producer surplus in our calculations.

How to treat costs?

- 2.24 We turn now to the closely related debate on the treatment of cost savings. A conventional defence for many, apparently anti-competitive, practices and mergers is that they are motivated by efficiency savings (eg reductions in transactions costs or synergies). We should therefore consider whether the ‘efficiency defence’ deserves recognition in our welfare calculus. The distinction between this analysis and the discussion above is that here we are not simply concerned with a transfer of ‘rents’ from producer to consumer but the creation of efficiencies that would otherwise not have occurred.
- 2.25 At this point, we should note that H M Treasury’s (1999) objective for the Competition Policy division at the OFT which included the clause: ‘to make business more efficient’. To a limited extent, this is uncontroversial. In that improved efficiency reduces price, or ameliorates a price increase, then a beneficial effect (for consumers) will be picked up in the price standard. If we are indifferent to producer surplus, then this is the end of the story: from a consumer perspective, it is irrelevant whether or not costs are reduced, all that matters is what happens to price. But, from a wider perspective, we may be interested in more than just the net effect on prices. Cost savings are, of course, welfare-enhancing for the firms. For example, suppose, as a result of a merger, costs are reduced by 3 percent, but price nevertheless increases by 2 percent. Consumers clearly lose out, but the merging parties are better off, and, at least some of their increased profit can be attributed to resource savings for society – savings which would not occur, absent the merger.

¹¹ For example, suppose we were to measure the net gain to society as the SAA minus the lost profits to the firms concerned; and suppose we were to approximate the latter (in a similar spirit to SAA) by the product of turnover and the hypothesised prevented price increase (in the case of a merger). In this case, the net welfare effect of a merger would always be zero by definition (absent indirect effects)!

2.26 Of course, this is the traditional Williamsonian welfare trade-off. Figure 2.2 depicts a case where a merger reduces costs from C_0 to C_1 , but, nevertheless, price rises from P_0 to P_1 . In terms of both SAA and consumer surplus, the merger is welfare-reducing, but aggregate welfare increases because (as drawn in this particular case), the increase in profits exceeds the loss in consumer surplus ($P_1DEC_1 - P_0AFC_0 > P_1DAP_0$). The force of this point can be strengthened if we re-introduce 'third party' competitors. What do we make, from society's point of view, if a merger or some practice has the effect of switching output from, say, high cost producers to low cost producers? Do we still steadfastly hold to the net effect on price, or do we attach some weight to the effects on profits, insofar as they reflect resource savings to society?

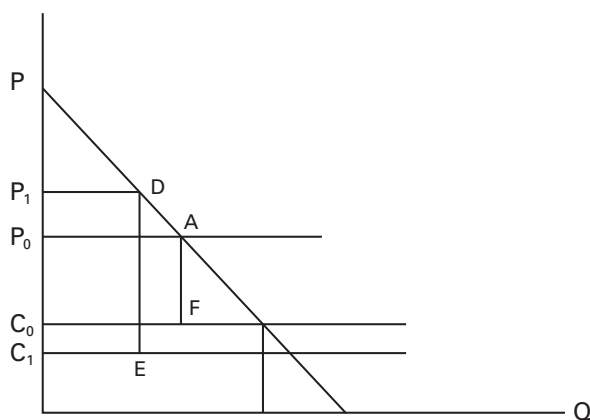


FIGURE 2.2 – THE WILLIAMSONIAN WELFARE TRADE-OFF

2.27 One possible response would be to adopt an intermediate welfare stance, such as the Hillside standard¹², which says that a merger should still be allowed when there is a price increase, so long as the marginal cost reduction exceeds the price increase ($P_0P_1 < C_0C_1$ in the diagram). Crudely speaking, this allows profits to be offset against a loss in consumer surplus, but only that part of profits due to enhanced efficiency.

2.28 While we are not unsympathetic to this approach, it would add considerably to the operational complexity of the analysis, and our conclusion remains as stated in the previous section. For the purpose of this project, the price standard is in general the appropriate measure of welfare. We would not rule out the occasional departure from that standard in specific cases but only if the empirical evidence provided strong and compelling reason to do so.

¹² McFetridge's (1998) terminology when interpreting the Canadian Court's decision in the Hillside case.

Other 'indirect effects'

- 2.29 The OFT consumer saving targets were originally set out in terms of the benefits consumers achieve from lower prices (see paragraph 1.3). However, there are other factors which consumers value, and which, conceptually at least, one might want to include in any assessment of consumer benefits. Notably, should we try to account for the impact of intervention on *product quality and choice*?
- 2.30 The following examples illustrate some of the possible issues. First, consider a merger in a differentiated products market. Suppose that the acquired firm's product was of an unambiguously higher quality, but that this is discontinued post-merger. If so, this reduces quality and consumer choice, assuming no other firms fill in the niche that it has left behind. Second, suppose an anti-competitive exclusive distribution agreement were removed, with the effect that prices were lower, but that some retail services were no longer provided. Third, consider a market in which firms compete over vertical quality and suppose that over time, competition leads to ever escalating expenditures on 'endogenous sunk costs' (Sutton, 1991). A merger between competitors may impact not only on second stage competition (ie in the short-run on price), but also in the first stage (long-run competition via R&D and/or advertising).
- 2.31 In principle, these effects might be handled theoretically, if we are prepared to specify the nature of the consumer's utility function – does he value choice *per se* – and if his preferences for vertical quality can be specified. In practice, however, we are doubtful whether they are easily observable or predictable and so do not seek to incorporate the effects in our consumer savings estimates.
- 2.32 Further indirect effects are considered in our literature surveys in the following chapters (eg 'dynamic' influences on costs such as innovation and learning by doing, avoidance of rent-seeking behaviour, externalities by virtue of vertical linkages, and deterrence). To anticipate the discussion and conclusions, we shall argue that these other indirect effects are typically very difficult to measure empirically and hence to operationalise. For that reason, they will not be incorporated into our proposed methodology for estimating consumer savings. So long as, by excluding indirect factors and focussing solely and conservatively on price effects alone, we do not systematically bias our estimates *upwards*, then we believe that a lower bound approach to consumer savings is still possible. In this regard, we take comfort in the evidence from Chapter 4 that competition is, more often than not, good for productivity and innovation.

How long might consumer savings last?

- 2.33 One other important question should be flagged at the outset – how long should we expect the benefits from a particular intervention to last? As we shall see below, the US authorities handle this question rather arbitrarily, with the choice of just one or two years. In the absence of any strong messages from the literature, it may well be that such an arbitrarily short period is the safest choice.
- 2.34 What is at issue here is partly the possibility that the firms involved may be able to achieve their objective through some other means (depending on the effectiveness of remedies put in place). But probably the key question is the counterfactual: how long would the market imperfection persist, absent the intervention, before the market finds its own solution, eg via new entry. Again, there are big issues involved here: is antitrust intervention largely temporary in its effects (alternatively, the ‘sticking plaster’ which speeds up the wound-healing, or the ‘finger in the dike’ which merely delays the inevitable¹³)? Since we cannot always be sure, it would be wise to assume short time scales for the consumer savings. More optimistically however, if the intervention provides the ‘once-for-all fix’ to a problem which would not otherwise go away, then only one or two years seems to be very conservative.

Infallible competition authorities?

- 2.35 Throughout this report we implicitly assume that the Competition Authorities act in the interests of society. It is not the aim of this project to challenge OFT or Competition Commission decisions. We take as given the parameters of competition law and, within this framework, that the OFT and the Competition Commission make the ‘correct’ decisions.
- 2.36 Of course, these are only working assumptions – made in order to confine the scope of this study to manageable proportions – and should not be interpreted (necessarily) as a display of blind faith in the capabilities of the UK competition authorities! Clearly, parallel, evaluative studies of the efficacy of decision-making in individual cases would be a useful complement to the present

¹³ For example, Clarke, Davies and Driffield (1998) report, for a number of their MMC case studies, that remedies are often quite soon overtaken by exogenous changes in the market. There is also an existing general literature on the persistence of monopoly profits and market dominance.

study. In this context, we should note that a recent review of a small sample of merger cases suggests that the OFT did indeed make the 'correct' decision in most instances¹⁴.

- 2.37 Naturally, in practice, asymmetries of information mean that it is likely that, from time to time, pro-competitive practices will be prevented by competition policy. Equally, there will be other cases in which anti-competitive practices and/or mergers are not blocked when they should be. To use an analogy with classical statistics, this is the issue of whether Type II errors (the former) dominate Type I (the latter). Given that OFT investigations are necessarily strictly time-constrained, and that only cases where there is an initial suspicion of potential adverse effects are investigated, it seems likely to us that anti-competitive practices/mergers are more likely to slip through without intervention than are pro competitive practices/mergers to be prevented. But this is, admittedly, an expectation, without solid factual support.
- 2.38 More generally, we consider that the other assumptions used in our approach are inherently conservative, and are most likely to offset – by far – the occasional mistake made by the competition authorities. For example, we believe that, by not making an allowance for deterrence, we systematically underestimate the true gain from competition policy¹⁵. Similarly, our preference for lower bound estimates will almost certainly bias downwards our estimates of aggregate consumer savings.

Conclusions

- 2.39 A simple method of estimating the consumer saving from intervention in any particular case is to estimate the beneficial effect on price, and to multiply this by the aggregate turnover of the firms or of the market concerned. This appears to be the approach used by the FTC and the DoJ in cases where more sophisticated techniques cannot be used. We have termed it the simple arithmetic answer (SAA). SAA is loosely equivalent to measuring the improvement in consumer surplus: the difference between the two depends on the price elasticity of demand, and may not be quantitatively large. For many practical purposes, SAA will suffice, and this is the measure we adopt forthwith.

¹⁴ OFT Research Paper 19, (1999). Here NERA concluded that: 'Of the 11 [merger] cases that were revisited, in most the decision to clear the merger was found to have been the correct one. In only two cases have subsequent events called into question the wisdom of clearing the mergers, though in both these cases further analysis would be needed to reach a definitive conclusion' (page 8). However, Clarke, Davies and Driffield, (1998) are rather more equivocal in their assessment of the efficacy of remedies put in place following MMC investigations of non-merger cases.

¹⁵ See Chapter 8.

- 2.40 In adopting the SAA, we should be aware that, in effect, we accept a simple price standard as the preferred welfare standard. We acknowledge that this excludes the potentially partly-offsetting effects on producer surplus which on some, but arguably not all, occasions might merit inclusion. Nevertheless, our view is that the price standard seems to be the best starting point. First, producer surplus is difficult to estimate and when to include it adds an element of controversy. Second, in those cases where it can be estimated, consumer savings estimates could be adapted to account for, say, genuine efficiency gains where compelling reasons exist to do so. Third, in any case, our approach is to err on the side of caution when estimating SAA for consumer savings.
- 2.41 In addition to the, more or less immediate, price effects, intervention may also have other, more difficult to quantify, indirect effects. These include innovation and deterrence. Amongst other things, the following chapters review the literatures on these subjects, having first recalled some of the salient features of the traditional monopoly welfare loss literature in the next chapter.

PART II: LITERATURE SURVEYS

3 THE TRADITIONAL LITERATURE ON MONOPOLY DEADWEIGHT LOSS

Introduction

- 3.1 The brief for this project suggested that we should conduct a preliminary review of the traditional academic literature on monopoly welfare loss. One purpose of this was to provide an upper bound 'guesstimate' for consumer savings – how much would consumers gain if, overnight, all elements of monopoly power in the economy were eradicated? Perhaps more seriously, a trawl of the 'old' literature might also unearth some useful insights into how one might quantify some of the effects listed in the previous chapter (especially paragraphs 2.29 – 2.32 on the indirect effects).
- 3.2 In the event, this has not proved a particularly fruitful exercise. Bibliographical searches reveal that very little research has been conducted on this topic in the last decade. In our opinion, the classic survey by Scherer and Ross (1990, pp. 661-85) remains the definitive – comprehensive and fair – statement of what has been learned from nearly half a century of research. For example, a more recent review by Dixon (1995) unearths little beyond the work already covered by Scherer and Ross.
- 3.3 The interested reader is referred to either of these sources for more detail, and our treatment here will be brief. First, we provide a historical overview of this literature. Second, we present the two standard methods (Harberger, 1954, and Cowling and Mueller, 1978) for recovering estimates of the basic welfare loss. Third, we suggest a simple extension to allow for oligopoly rather than monopoly. Fourth, we use this to compute a speculative estimate of the current aggregate welfare loss for the UK. Fifth, we briefly review any lessons to be learned on what we have referred to as the indirect effects. Finally, we conclude.

Historical overview of the literature

- 3.4 A time series of the number of academic papers written over the last 50 years, on the subject of monopoly welfare loss, reveals a very distinctive life cycle pattern. The literature began with Harberger's seminal contribution in 1954, in

which he estimated the loss from monopoly to the USA to be no more than one tenth of one percent of national income. This was followed over the next 25 years by an accelerating number of papers – some were entirely derivative (merely replicating his methodology for other countries/time periods); some tinkered with the details of his (undoubtedly over-simplistic) empirical methodology; and a few raised more thoughtful worries (eg general versus partial equilibrium). However, until about 1980, the general consensus was probably that Harberger was qualitatively correct: monopoly power costs the typical society relatively little. Perhaps Harberger had underestimated the magnitude of the welfare loss, but few would argue that it exceeded, say, 1 percent of GNP.

- 3.5 In 1978, however, this became a subject of hot controversy, with the work of Cowling and Mueller, suggesting that the cost of monopoly was, in fact, far higher. This was partly the result of estimating the welfare triangle itself in a different way, and partly because they included the cost of rent-seeking behaviour: their alternative estimator of the welfare triangle produced a figure for the UK of nearly 4 percent, and when rent-seeking was also included, the cost increased to over 7 percent.
- 3.6 Their contribution ensured that the topic continued to attract considerable research activity through the 1980s. One of the more imaginative contributions was by Masson and Shaanan (1984), who devised a methodology which they claimed was capable of identifying (i) the full potential monopoly loss, and (ii) the actual loss, taking into account the effects of actual and potential competition. For the US, their estimates were 11.6 percent and 2.9 percent respectively of total turnover.
- 3.7 Although papers continued to appear fairly frequently through the 1980s, with hindsight, it is now clear that diminishing returns were already setting in (the 'product' was in the 'maturity' stage). Most studies were by now highly derivative, and in recent years, interest in the topic seems to have more or less dried up. Writing in 1990, having attempted to correct for a variety of errors and inconsistencies in Harberger's original methodology, Scherer and Ross (p. 667) suggest that 'the dead-weight welfare loss attributable to monopolistic resource misallocation in the United States lies somewhere between 0.5 and 2 percent of gross national product.'

Lessons to be learned from the basic methodologies used

3.8 By the 'basic methodology' we mean simple comparisons of monopoly with perfect competition, when only price is assumed to differ (figure 3.1). Defining welfare loss as the area of the traditional triangle of net lost surplus, and assuming linear demand and constant marginal costs¹⁶, its magnitude, as a proportion of turnover, depends only on:

- m : the prevailing price cost margin, and
- the slope of the demand curve, which depends, in turn on e , the price elasticity of demand.

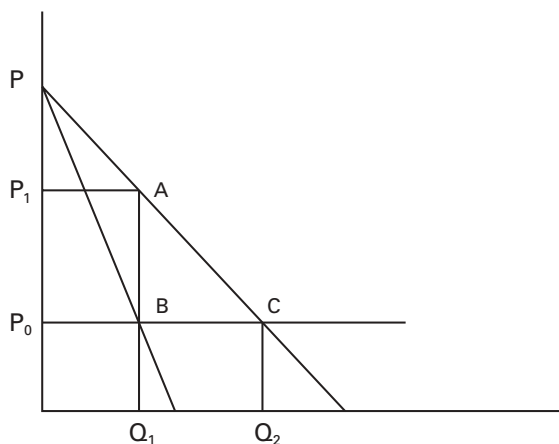


FIGURE 3.1 – THE DEADWEIGHT WELFARE LOSS

3.9 Thus, in figure 3.1, denoting welfare loss by WL , turnover by T , monopoly price and quantity by P_1 and Q_1 , and competitive price and quantity by P_0 and Q_0 .

$$WL = \Delta ABC = 0.5 \cdot (P_1 - P_0) \cdot (Q_0 - Q_1) \quad (3.1)$$

$$T = P_1 \cdot Q_1 \quad (3.2)$$

3.10 Now note that the elasticity moving from monopoly to competitive price can be defined by:

$$e = - \left\{ \frac{Q_1 - Q_0}{P_1 - P_0} \right\} \left\{ \frac{P_1}{Q_1} \right\} \quad (3.3)$$

¹⁶ Since this is for expositional illustrative purposes only, and nothing hangs on any of the estimates in this chapter, we shall assume linear demand and costs throughout. Clearly, a more rigorous exposition would consider the approximations involved by, say, the linear demand assumption.

3.11 Substituting out for the quantity change in (1) by substituting in from (2), and rearranging gives:

$$(WL/T) = 0.5e.m^2 \quad (3.4)$$

$$\text{where } m = \{(P_1 - P_0)/P_0\} \quad (3.5)$$

3.12 In other words, the magnitude of deadweight loss depends on (a) by how much the monopolist raises price over the competitive level, and (ii) how responsive is demand to this price rise.

3.13 In essence, (3.4) provided the basis for Harberger's original estimate of a value for WL/T of 0.001, ie one tenth of 1 percent. As already mentioned, the precise methods he used to derive his estimates of m have attracted considerable criticism. However, it is unnecessary to delve into that debate¹⁷. Suffice to note that he arbitrarily assumed $e = 1$, and working backwards from (3.4), this implies a value for $m = 0.044$. A typical monopoly price cost margin as low as 4 percent seems implausible, and it is hardly surprising that his estimated welfare loss is so small. Digressing briefly back to our SAA in Chapter 2, this would mean that an upper limit on how much antitrust intervention could save the consumer would also be 4.4 percent, and, even then, only if monopoly power was completely eradicated!

3.14 Many aspects of the Harberger methodology came under attack in the years following his original article. However, we shall focus on just one, and this is because it touches upon an issue which will be relevant in our own work when estimating consumer savings in particular markets (Chapter 7). When he computed a value for WL/T in (3.4) using independently derived estimates of m and e , Harberger failed to acknowledge that the two are causally linked (or, at least, jointly determined). This is easily illustrated by recalling that a profit maximising monopolist will set its price such that its price-cost margin is:

$$m = e^{-1} \quad (3.6)$$

3.15 Thus, an assumed value for e immediately also sets a value for m (or vice versa). Not only did Harberger fail to realise this, but also he selected a nonsensical value for e . By setting $e = 1$, he assumed implicitly, that marginal revenue is zero, which is obviously inconsistent with a profit maximising monopolist with positive marginal costs! (This logical flaw was frequently seized upon with glee in the post-Harberger literature).

¹⁷ See Scherer and Ross (op. cit). or Hay and Morris (1991).

3.16 Cowling and Mueller (1978) exploited this endogeneity to derive a second, alternative estimator, which obviates the need to estimate e , and was not internally inconsistent. Noting that, under monopoly with linear demand, WL is exactly half of monopoly profit, it follows that:

$$WL/T = 0.5\Pi_m/T \quad (3.7)$$

3.17 The key geometric insight here is that, under monopoly with linear demand, $Q_0 - Q_1 = Q_1$. Alternatively, in our terms, inserting (3.6) back to (3.4) implies:

$$WL/T = 0.5m \quad (3.8)$$

3.18 Again, there is little to be gained from delving too deeply into the details of their calculations. Suffice to say that these were also heavily criticised, and that the task of extracting an estimate of that part of accounting profit which is monopoly rent is fraught with practical and conceptual difficulties. However, for the record, this approach yielded an estimate of WL/T in the region of 0.04, which suggests a more plausible typical monopoly mark-up of about 8 percent.

3.19 Thus far, the main insight appears to be that the deadweight loss can be estimated if one has access to estimates of only two key parameters – the monopoly mark up and the demand elasticity. More correctly, as shown by Cowling and Mueller, but overlooked by Harberger, only one of these needs to be known. Cowling and Mueller opt for m . Equally, of course, it would be possible to proceed purely on the basis of e . Returning to (3.4) and (3.6), but now substituting out for m , we find:

$$(WL/T) = 0.5.e^{-1} \quad (3.9)$$

3.20 Expressed in these terms, it would seem that estimating aggregate monopoly deadweight welfare loss is one of the easier exercises in applied economics. Of course, the reverse is true. Either we make an heroic, but essentially arbitrary, estimate of the typical demand elasticity in an economy as a whole, or we opt for assumptions about the typical monopoly mark up. Both are daunting tasks. For all the increasing sophistication of econometric demand systems in recent years, we know of no source which provides a comprehensive set of demand elasticities for all products in any economy, and the same is true for monopoly mark-ups¹⁸.

¹⁸ Indeed, if information on the latter were really readily available, the task of OFT and others in targeting markets of policy concern would be very much simpler. If this were the case, it is doubtful whether anyone would ever bother computing estimates of the aggregate welfare loss.

3.21 Nevertheless, there is, at least, a ‘parable’ value, in that this focuses attention on the sorts of information which would be helpful in identifying the potential for consumer savings in individual cases, for which the task of estimating m and/or e might be more manageable.

Allowing for oligopoly

3.22 We should immediately temper the optimism of the previous sentence by recalling a very major limitation on the Cowling/Mueller methodology – it assumes pervasive monopoly, when most of the firms in the sample, and most of the markets with which we shall be concerned are oligopolies.

3.23 Returning briefly to the historical literature, there was a number of second generation papers replaced monopoly with various models of oligopoly; for example, Gisser (1986) and Willner (1989) on price leadership, and Masson and Shanaan on limit pricing (1984). Of course, substituting oligopoly for monopoly is preferable on the grounds of realism, but it also requires specific assumptions about the nature of the oligopoly game, usually requiring estimates of concentration, and, ideally, specific models of product differentiation. In the climate of the 1970s and 1980s, it was perhaps acceptable for researchers to posit a single global oligopoly model, but today this would be seen as a gross and unacceptable over-simplification. There is little of value, for our purposes, in dwelling on this part of the literature. However, to give a feel for just how sensitive global estimates of welfare loss might be to the substitution of oligopoly for monopoly, we briefly reconsider Cowling and Mueller’s methodology, but now assume that the typical market is characterised by a homogeneous product Cournot oligopoly. In this case, it is well-known that:

$$m = H.e^{-1} \tag{3.10}$$

where H is the Herfindahl concentration index.

3.24 As before, we might proceed by either substituting out for e or m . Substituting (3.10) into (3.4) gives either:

$$(WL/T) = 0.5H.m \tag{3.11}$$

or

$$(WL/T) = 0.5H^2.e^{-1} \tag{3.12}$$

3.25 Two obvious points follow. First, we will now need to estimate an additional ‘real world’ variable –market structure, in this (homogeneous Cournot) case, the Herfindahl index; arguably, this is rather easier to observe than e or m .

Second, and recalling that the H index is bounded between 0 and 1, and, in symmetric cases, takes the value of the reciprocal of firm numbers, it is obvious that (3.11) or (3.12) will scale down the monopoly estimates by an order of magnitude – down to 10 percent of the previous estimates if $N = 10$ say.

A speculative estimate of the contemporary UK oligopoly welfare loss

- 3.26 For completeness (and possibly light relief!), we shall now attempt to calibrate (3.11), using estimates of H and m. For m, we shall use two leads from the literature. As already noted, the Cowling and Mueller paper implies $m = 8$ percent. Scherer and Ross's reading (op. cit. p.664) of the wider literature was that 'the data used in monopoly misallocation studies rarely show price-cost deviations in excess of 15 to 20 percent'. Therefore, a reasonable ball-park figure might be $m = 0.1$.
- 3.27 Unfortunately, H is not published in the UK production census, or in any other official source. However, we do have official estimates of the 5 firm concentration ratio at the 3 digit level. Using Davies and Geroski's (1991, table 1, p.8) 'typical' values of the market shares of each of the 5 largest firms within the typical concentration ratio, and making an allowance for the shares of the smaller firms, a fair guess for H in the typical 3 digit industry is about 0.05. In fact, this is very much a lower bound, since most 3 digit industries are aggregations of a number of well-defined (4 or 5 digit) markets. Assuming that there are 4 well-defined markets within each 3 digit industry, and that the majors are typically diversified equally into, say, two of the four, it is easily shown that the typical H value in a properly defined market is about 0.1.
- 3.28 Inserting $m = 0.1$ and $H = 0.1$ into (3.11) suggests that **the aggregate welfare loss is about one half of 1 percent**. Interestingly, this corresponds exactly to the lower bound of the range suggested by Scherer and Ross (see paragraph 3.7). In fact, it would not be difficult to bring our estimate closer to their upper bound by arguing either that we have underestimated typical concentration levels, or that the Cournot assumption is too optimistic in what it implies for the toughness of competition in the typical market¹⁹.
- 3.29 In any event, given that UK GDP is currently in the region of £900 billion, this suggests a conservative deadweight welfare loss of £4.5 billion, perhaps rising to £9 billion on less conservative assumptions.

¹⁹ For example, our estimate would double if we were to assume that, in the typical market, five equivalent equal sized firms is more likely than the 10 our above calculations imply, or, alternatively, if we posited a conjectural variations (CV) oligopoly model in which the CV parameter was half way between Cournot and collusion.

3.30 How does this welfare loss translate into potential consumer savings? The loss in consumer surplus from non-competitive pricing is simply the deadweight triangle plus supernormal profits. Since we have assumed a mark-up of 10 percent, this implies lost consumer surplus of between 10.5 and 11 percent of GDP, ie £94.5 to £99 billion per annum. With tongue still very firmly in cheek, this might be interpreted as the ceiling for what OFT could achieve on behalf of UK consumers!

Lessons to be learned about the 'indirect' effects

- 3.31 Beyond these simple direct price effects of monopoly power, this literature also explored a variety of other indirect inefficiencies which might be associated with market power. At the outset of this project, we had hoped (admittedly without much conviction) that this might provide some pointers for how we might best incorporate such effects in our assessments of the indirect effects when looking at specific cases of anti-competitive behaviour or mergers.
- 3.32 It is only fair to this literature to concede that it has raised most of the relevant issues, but it would be misleading to suggest that it has yielded any rigorous methodologies for quantifying them. Again, the reader is referred to either Scherer and Ross (1990) or Dixon (1995) for the details. Here, we will merely touch on a sample of the more interesting suggestions and findings.
- **Partial versus general equilibrium.** The above analysis is, of course, partial and confined only to the particular market in hand. In a more general setting, we would need to know what use is made of the resources not used as a consequence of monopoly output restriction. The implication of the partial analysis is that the unused resources are worth no more or less to society than their marginal cost in the industry of concern. However, the ensuing worries about the 'second best' probably need not concern us in our work, in which a partial stance is more defensible.
 - Relatedly, there may be '**knock-on' effects into vertically related industries, and, indeed, the labour market.** Of the two, Scherer and Ross attach more importance to the latter, concluding (p.666): 'there is evidence that as much as two-thirds of the gains from monopoly power are realised in the form of higher wages.' Unfortunately, this claim is based on two, very early, perhaps statistically fairly primitive, papers.
 - **Effects on costs: does monopoly incur greater X inefficiency?** There was quite a large literature on whether or not market power is typically associated with more slack and non cost minimisation. Much of this was anecdotal or very case-specific, and defies generalisation. There were also

a number of large cross-industry, and sometimes cross-country, regression studies, loosely speaking within the structure-conduct-performance paradigm. Again, Scherer and Ross provide a comprehensive summary and quotable conclusion:

The evidence is fragmentary, but it points in the same general direction. X-inefficiency exists, and it is more apt to be reduced when competitive pressures are strong...What we do not yet know is (whether) the magnitude of differences (is) systematically correlated with monopoly power. It seems eminently plausible, however, that X-inefficiencies attributable to monopoly are at least as large as the welfare losses from resource misallocation.

- **Effects on innovation.** There is, of course, an extensive literature on market structure, competition and innovation. In general, this had little impact on the welfare loss literature. We discuss this in the next chapter.
- **Losses from rent-seeking and protecting monopoly power.** This is arguably the most contentious issue within the welfare loss literature. Following Posner's lead, Cowling and Mueller argued that any assessment of the social costs associated with monopoly should take into account the (wasteful) expenditures incurred by monopolists in acquiring their monopolies in the first place, and then strategically defending them. Using the analysis described in our previous section as their starting point, Cowling and Mueller proceed to accumulate a much bigger estimate of the final social costs by assuming that firms spend up to full monopoly profit in acquiring that profit and then use advertising (all assumed to be socially wasteful) to protect it. As an exercise in rhetoric, this paper succeeded in getting this issue on to the agenda, but, as a methodology in positive economics, we would prefer to put it to one side. No attempt will be made in our work to allow for rent seeking. The subject is too controversial (see Littlechild's critique, 1981) and there is little prospect that we could make it empirically operational in our own work.

Conclusions

- 3.33 Given the objective of the current project, a natural starting point for any review of the traditional literature was the 'social cost of monopoly'. Not unexpectedly however, our review has proved disappointing – the 'old' literature is just too broad-brush and laced with such questionable assumptions as to be, at best, illustrative. It also appears that there have been very few contributions in recent years that are of much interest for our purposes. Our slight hope that advances might have been made, of which we were unaware, was frustrated. For these reasons, the chapter has been brief.

- 3.34 For the less disillusioned reader, there might be some pointers of interest. First, even if one opts for the smallest estimate in the conventional literature, the absolute magnitude of the deadweight loss from monopoly would be considerable: one-tenth of 1 percent of GDP (£900 million per annum in contemporary UK terms). Second, this rises quite rapidly once one moves away from Harberger's flawed methodology: even the assumption of Cournot behaviour generates a ballpark figure of about £4.5 billion. Third, these are estimates of the welfare triangle; the loss of consumer surplus from prices exceeding marginal costs are much larger – roughly ten fold in the Cournot case.
- 3.35 Beyond the simple welfare triangle, it is clear that the total welfare loss might escalate quite dramatically if one believes that there are significant losses from X-inefficiency, rent-seeking etc. Unfortunately the literature reviewed here fails to generate anything with the status of a, generally accepted, stylised fact, and we prefer to adopt a fairly cautious conclusion from this literature. It does not dispel the notion that, were one able to remove all elements of monopoly power from the UK economy, there would be considerable savings for the consumer – savings that would exceed the costs of the OFT by an order of magnitude. However, we do not believe that any of the particular estimates in this literature should be taken very seriously.

4 COMPETITION AND EFFICIENCY

Introduction

AIMS

- 4.1 This chapter reviews the main messages to emerge from the existing theoretical and empirical literatures on the effects of ‘competition’ on ‘efficiency’. This is a necessary adjunct to the previous chapter. While the traditional welfare loss debate always acknowledged the theoretical possibility that market power may have cost, as well as price, implications, this was only rarely incorporated empirically into estimates of the net cost of monopoly²⁰.
- 4.2 Nevertheless, the literature on competition and efficiency is voluminous, especially if both terms are to be broadly defined, as here. Therefore, rather than attempt to provide a comprehensive new survey from primary references, we shall draw on a number of perfectly competent recent surveys²¹. In effect, we ask three questions of the literature:
- Is there reasonably conclusive support for the contention that increased competition leads to improvements in ‘efficiency?’
 - If so, can one point to ‘typical’ magnitudes?
- If, in the event, conclusive answers to these questions are not possible,
- does the literature still offer some suggestive pointers as to what the practitioner might look for in any particular case?
- 4.3 The rest of this introduction clears the ground by first defining what we mean by ‘efficiency’ and ‘competition’, and then offers an intuitive interpretation of the main issues involved. In the next two sections, we draw out the main conclusions from the theoretical and empirical literatures respectively. Finally, we conclude.

DEFINING TERMS

- 4.4 In order to identify what are the relevant academic literatures, we must first define the two terms.

²⁰ Of course, given our own emphasis on the consumer welfare standard, efficiency or cost effects are only of interest inasmuch as they impact on price or the range of products on offer (if efficiency is defined to include product innovation).

²¹ See, for instance, Haskel (1996), Vickers (1995), Nickell (1996).

Efficiency

4.5 In principle, this chapter covers everything other than allocative efficiency, ie:

- **static technical efficiency:** in standard textbook terminology, how close are firms to the isoquant; or (almost equivalently) are marginal (and sometimes fixed) costs minimised? We shall interpret this as synonymous with X-efficiency. In the empirical literature, this is often investigated by looking at labour/total factor productivity,
- **dynamic efficiency:** the rate at which firms reduce their real costs over time, or, equivalently, the rate at which productivity increases, and
- **technical progressiveness:** which depends on R&D, patents, innovation and diffusion – to some extent this is subsumed within dynamic efficiency (for process innovation), but product innovation raises additional welfare issues, not captured by looking only at costs.

Competition

4.6 This is not a straightforward concept²², and within the academic literature, there is considerable diversity: theorists model the intensity of competition in a various ways, and empiricists employ a variety of empirical measures when conducting their tests. However, this is not necessarily a weakness, it merely reflects the fact that ‘competition’ is not a unidimensional concept.

- Most of the early literature was inspired by the Structure-Conduct-Performance paradigm, involving cross-industry econometric comparisons. This methodology persists today (see Nickell (1996) for a rather superior example), and it tends to represent the intensity of competition using standard proxies for the degree of oligopoly or the condition of entry, such as seller concentration, the number of competitors, entry barriers and entry rates. Sometimes, variables measuring exposure to foreign competition are also included.
- Within the recent theoretical literature, differences in the toughness of competition are often modeled by contrasting the equilibria generated by Bertrand, Cournot and Collusion (see, for example Aghion, Harris and Vickers (1997).) Alternatively, a specific parameter is sometimes used as an indicator, and comparative statics on the parameter

²² Vickers (1995) is helpful in clarifying thoughts.

are used to investigate the impact on efficiency etc²³. The empirical counterpart to this branch of the theoretical literature is the ‘New Empirical Industrial Organisation’, which often employs a conjectural variation parameter in this role.

- Some of the most interesting recent empirical work uses the natural experiments afforded by programmes or specific policies of deregulation, liberalisation, and privatisation; here a before and after comparison is meant to reveal the impact of a once-off increase in the intensity of competition. Of course, these natural experiments are not mutually exclusive with the above approaches, since a switch in policy regime may affect concentration, entry and the mode of behaviour.

What are we looking for? The simple ideas

- 4.7 After many years of academic neglect, this topic has taken off over the last twenty years. However, the literature has fast become professionalised, technical, and (inevitably) less accessible²⁴. Therefore, in order to pick a way through this literature, it might be helpful to begin with some basic ideas, each with intuitive resonance, and each addressed by some of the papers in this area²⁵.
- 4.8 The intuitive case in favour of competition might be represented by three ideas.
- 1 Competition disciplines firms to avoid internal waste and to strive for efficiency. So spoke Adam Smith (*‘competition forces every body (to pursue efficiency) for the sake of self-defence’*), and echoed Hicks (the *‘quiet life’* is the greatest reward to monopoly).
 - 2 In a competitive environment, the efficient will prosper at the expense of the inefficient.

²³ For Martin (1993), this is the steepness of a firm’s profit function with respect to its own cost level; for Boone (2000), competitive pressure is measured by the incentive to undertake innovation; and in Aghion, Harris, Howitt and Vickers (2000), it is measured by the degree of substitutability between the products of competing firms. (To be faithful to these, and other, authors, we should acknowledge that their measures are not always literally single fixed parameters – we simplify for the sake of brevity).

²⁴ This is partly because, as already mentioned, competition and efficiency are multi-dimensional, and partly because the seminal contributions have provoked second generation research, finessing (but sometimes overturning) the original results.

²⁵ This chapter ignores one other potential source of inefficiency in ‘monopolistic’ industries: where resources are spent on deterring entry. We treat this as the costs of rent seeking (covered elsewhere). Note, however, that such activity (especially when designed to raise the costs of potential entrants) may also raise costs for the incumbent itself.

- 3 The incentive to innovate is greater in competitive environments, as firms strive for a dominant market position and the rents it yields. Monopolists, on the other hand, will be disinclined to pursue new products which may merely displace the profits from their existing products.

On the other hand, there are at least two intuitively appealing ideas which work in the opposite direction.

- 4 Even if competition demands that individual firms should be more efficient (point (1)), the welfare implications may still be unclear, in that the increased firm numbers (implied by some characterisations of competition) can imply wasteful duplication. These may be static (too many factories making the same thing, and not exploiting scale economies), and/or dynamic (too many firms duplicating research expenditures in pursuit of the same innovation).
- 5 Monopoly and large firms may be better equipped to generate innovation, in that they have both the wherewithal to fund costly R&D and the size needed to fully exploit the innovation, once made. Competition, on the other hand, may mean more rapid imitation, which can dampen the incentive to undertake risky ventures.

The theoretical literature

- 4.9 We turn first to theory for insights on each of these ideas in turn.

COMPETITION DISCIPLINES (IDEA 1)

- 4.10 Much of the recent theoretical literature has tackled this idea in terms of the agency problem: where there is a divorce of management from ownership, owners face a problem in ensuring that managers apply sufficient effort, given that effort is inherently unobservable. Intuition might suggest that the forces of competition would constrain the extent of slack, or insufficient effort.
- 4.11 There are already a number of existing surveys of this part of the literature – most definitively, Vickers (1995) – and, as there appears to have been no major theoretical breakthroughs in the last four to five years, a brief summary will suffice here, with the interested reader referred to one of those surveys²⁶.

²⁶ Haskel (1996)'s treatment is derivative of Vickers; Nickell (1996) includes a short, but incisive, summary; and Church and Ware's (2000, pp.99-101) recent intermediate textbook is a fair reflection of non-specialists' understanding of the upshot of this literature.

4.12 There is a variety of different strands running through this part of the literature, but, broadly speaking, they can be grouped under two variations on the theme.

- Greater competition means more information. In turn, this makes slacking easier to detect, and provides managers with the motive to reveal their true worth, by working harder to establish a reputation, and thereby increase their future earnings.
- Greater competition increases the pressure (via reduced profits and market shares) on potentially inefficient managers not to slack.

The information-enhancing effects of competition

4.13 Inefficiency within the firm can arise in the principal-agent setting because owners have difficulty in detecting how much effort their managers are expending. In an uncertain world, they are unsure just how much the performance of the firm reflects the managers' efforts, as opposed to the external environment. The basic idea is that competition can help because owners are able to agree sharper (better informed) and more efficient contracts if they are better able to observe the performance of managers of other similar firms – a form of *'yardstick competition'*. This is because the latter provides more information on the state of the world, and, by deduction, the effort of their own managers. Moreover, once effort can be detected more readily, this increases the incentive for managers to work harder – more effort now establishes a verifiable *'reputation'*, which will be rewarded in the future by higher salary.

4.14 However, for this effect to bite, it is necessary that competing firms should face the same state (or, at least similar states) of the world, ie be exposed to similar demand and cost shocks. More precisely, as Vickers shows (p.11), it is necessary that *'the correlation of measurement errors exceeds that of abilities'*. It follows that yardstick competition only leads to more effort if the firms compared are in head-on competition (more likely where demand-and supply-side substitutability is high) and, probably, where there is less heterogeneity and uncertainty regarding the dynamics of demand and technology. It also requires relatively more heterogeneity in the quality of the managers being compared.

Competition raises the pressure, through the product market, on the inefficient

- 4.15 A number of different classes of model have explored this effect. One class includes Hart (1983) and Scharfstein (1988), who model industries as including two types of firm:
- E: efficient (owner-managed entrepreneurial) firms who maximise profits, and
 - M: potentially inefficient (managerial) firms.
- 4.16 The potential for inefficiency derives from managerial slack in the M firms, and the purpose of the models is to investigate whether competition from E firms effectively constrains the extent of slack by managers of M firms. In Hart's model it does. He assumes that M firm owners set their managers a profit target. Such a simple contract means that the managers will wish to react to a favourable industry-wide shock (eg a reduction in costs) – which is unobserved by the owners – by increasing their slack, since it is now easier for them to achieve their profit target. Entrepreneurial firms, on the other hand, will react to reduced costs by reducing their price, and, given a significant presence of E firms in the market, this will squeeze the profits and market shares of M firms, thereby forcing them to cut back on the slack that they would otherwise be able to take. However, Scharfstein's model shows how this result can be reversed, by allowing, alternatively, for more realistic contracts, in which managers and owners may agree to allow the profit target to vary, depending on the state of the world reported by the manager. In this case, the presence of E firms can result in contracts within the M firms being such as to increase slack in adverse states of the world (depending on how managers value slack and income).
- 4.17 A similar indeterminacy occurs in another class of model, in which the intensity of competition is modelled differently. Here, all firms are assumed to be of the M type, but competition is defined to be greater, the more firms there are. Martin's (1991) Cournot model shows that more competition reduces efficiency, because more firms means lower outputs for each firm, and lower outputs mean that there are lower incentives to increase efficiency. On the other hand, Horn et al (1994) show how this can be reversed by modelling competition as the potential for imports and exports: while import competition has the same affect as increased numbers in the Martin model, export opportunities provides an added incentive to increase size and therefore effort and thereby reduce costs.

4.18 Willig (1987) focuses on exogenous changes on the demand side, showing that an increase in the demand elasticity facing the firm will raise efficiency, while a downward shift in its demand curve will have the opposite effect. Since an increase in competition might, in principle, lead to both effects, again, the result is indeterminacy²⁷.

4.19 While this selection is by no means exhaustive, it is sufficient to illustrate why most previous surveyors of the literature have tended to opt for very conditional and guarded overall conclusions. Thus, Vickers (p.12) concludes by explaining that:

Depending on contracting possibilities and the information structure, competition was shown to improve efficiency in many, but not all, circumstances'

and Nickell (p.728) claims that:

Overall, there is some theoretical basis for the belief that competition drives productivity improvements forward. But the basis is not, as yet, a strong one.

Effect on worker effort

4.20 A related body of work explores whether worker effort, and therefore costs via labour productivity, are sensitive to the extent of product market competition (one of the main contributors, Haskel, summarises, 1996, pp.10-14). This work derives from the bargaining literature, in which it is assumed that workers and the firm bargain over effort (eg work practices) and wages, and the firm sets employment. There is an obvious intuitive expectation. Where firms earn 'monopoly' profit in the product market, the effect of bargaining will be to transfer some of this to the workers in the form of reduced effort and higher wages; but, as competition increases, this reduces the surplus available over which to bargain, and workers will be forced to accept lower wages and increased effort. This expectation is indeed confirmed in simple models²⁸.

²⁷ Schmidt (1997) and Hermalin (1992) are two other significant theoretical contributions on this question. But they only serve to confirm that there are factors working in both directions.

²⁸ There is the possibility of perverse results in more complicated models with certain types of worker (labour union) utility functions, in which avoidance of effort has primacy. In that case, workers might respond to a tougher bargaining situation by accepting a revised package in which both wages and effort are lowered. However, this is of only secondary concern for present purposes – so far as the firm's marginal costs are concerned, it does not matter whether competition reduces them because workers work harder, or because they accept lower wages. There is also some discussion in this literature about whether increased effort in more competitive environments is necessarily welfare-enhancing: consumers may gain from reduced product price, but workers lose by having to work harder. However, so long as we are concerned only with consumer welfare, this is irrelevant.

COMPETITION ALLOWS THE MORE EFFICIENT TO PROSPER (IDEA 2)

- 4.21 This idea appears in a number of different places in the literature, but there is no self-contained set of papers to which we can quickly appeal for a clear message. However, two points are easily made.
- 4.22 First, there is a simple point about aggregation. Suppose that, in a given industry, firms exhibit different levels of marginal costs (ie efficient coexist with inefficient). The most sensible way to summarise the 'typical' level of industry marginal costs is by measuring the weighted average, where the weights reflect the market shares of the firms concerned. It follows that, for a given set of firms (distribution of marginal costs), the weighted average will be lower, the greater the tendency for the most efficient firms to achieve the largest market shares. In a simple homogeneous good Cournot equilibrium, there is, indeed, a simple linear inverse relationship between market share and marginal costs. This is also true for a wide range of other models.
- 4.23 Second, given that this inverse relation exists, is it accentuated as an industry moves towards a 'more competitive' mode of behaviour? Certainly, under the tougher competition implied by Bertrand competition this is very starkly the case, since only the most efficient firm will survive. Under more collusive regimes, on the other hand, market sharing will tend to dampen the extent to which cost efficiency leads to higher market shares.
- 4.24 A classic reference here is Olley and Pakes (1996). They found that the effect of deregulation in the US telecommunications equipment industry was to raise industry productivity growth, even though the simple (unweighted) average productivity growth of all plants in the industry was unaffected. They inferred that this was precisely because more efficient firms were increasing their share, having an increased impact on the weighted average, but not, of course, on the unweighted average.

COMPETITION LEADS TO WASTEFUL DUPLICATION (IDEA 4)

- 4.25 A nagging doubt about competition is that it leads to wasteful duplication. Historically, this was part of the justification for post-war nationalisation in the UK; and, more generally, it is part of the justification of the continuing state provision of some products. It also resurfaces in the rhetoric often used to justify joint research ventures.
- 4.26 In terms of basic theory, natural monopoly is an example of an industry in which competition cannot be justified (or maintained) on welfare terms. Beyond this, the easiest way to illustrate the duplication argument is to draw on the literature on '*does competition lead to excess entry?*' The standard

reference, Mankiw and Whinston (1986), shows that in a symmetric Cournot industry, supplying an homogenous good, each firm incurring a fixed costs and constant marginal cost, there will indeed tend to be too many firms in equilibrium. This is because, with the entry of each new firm, the reduction in price raises consumer surplus by less than it reduces producer surplus (the 'business-stealing' effect). Total surplus therefore falls.

- 4.27 However, one can argue that what drives this (and other) depictions of the duplication critique is an inappropriate characterisation of the intensity of competition by the number of (cloned) firms. In reality, the true vibrancy of effective competition occurs when there are (perhaps many) firms trying different ways of doing the same (or similar) things – variety is the key word. Indeed, even within the restrictive setting of the Mankiw and Whinston model, this can be seen by dropping the unrealistic assumption of symmetric firms. For example, in a series of simple examples, still within the Cournot setting, Vickers (1995) shows how a more efficient entrant might actually increase total welfare by shifting industry output away from the inefficient towards the efficient – at the limit, the efficient entry might bankrupt inefficient incumbents. More generally, once one allows for different efficiency levels between firms, the deflationary effect of entry on producer surplus tends to be ameliorated. An alternative form of heterogeneity is product differentiation. In this case, entry not only reduces price but also increases product variety. This can obviously overturn the duplication critique when consumers place a high value on variety (see Cabral, 2000, p.254).

FIRMS ARE MORE ABLE TO INNOVATE WHEN SHIELDED FROM INTENSIVE COMPETITION *VERSUS* COMPETITION INCREASES THE INCENTIVE TO INNOVATE (IDEAS 5 AND 3)

- 4.28 This is the traditional debate instigated by Schumpeter (1943, an advocate of idea 5), and famously contested by Arrow (1962, idea 3). Surveys of the theoretical literature are numerous, but rarely conclusive. A good example is Haskel (1996, p.16), who concludes: '*So since theory seems to provide no unambiguous predictions it would seem to be an empirical matter.*' This is a fair conclusion, although it should be stressed that the lack of any strong consensus is not necessarily a weakness of the theory. If, indeed, there are factors working in opposite directions, it does seem perfectly reasonable to conclude that 'it all depends on the case in hand.'
- 4.29 Arguably, the biggest contribution of the theoretical literature on competition and innovation is that it provides perspectives and insights which are sometimes overlooked in more static analysis. For instance, in more recent years, the debate has conceptualised competition not so much in terms of the numbers of competitors, but more as a dynamic process, in which there is a 'degree of

rivalry'. Indeed, this is apparent to some extent even in the early 'patent race' literature – in this, there is a given patent (innovation) which is out there to be won – and the question is what degree of rivalry is most conducive to early innovation.

- 4.30 Carlton and Perloff (1994, Chapter 17), for example, provide a textbook introduction to patent races. Theory suggests that patent races can lead to both monopoly or competitive firms innovating more quickly than they otherwise would. Equally, the patent race has ambiguous effects on final market structure. On the one hand, the monopolist may innovate early to get a large enough lead on its rivals so that they drop out of the race. If so, the monopolist remains a monopolist due to its early innovation. On the other hand, if the expected prize is high enough, rivals may not drop out of the race. If the incumbent does not win the race then (so long as the innovation is not so 'drastic' that the rival becomes a monopolist itself) the market structure becomes a duopoly. The crux of the issue here is that competition means that there is more than one potential innovator. Thus, in the sense that we define competition as a 'race' to produce a superior product (or find a superior process), it may be conducive for innovation²⁹.
- 4.31 An alternative approach is one in which there is a (potentially never-ending) sequence of innovations which are to be made. The main players are *already* in the industry, and thus already earning some profits. (In this setting, both the rate of innovation and market structure itself are endogenous). This leads to questions such as 'is rivalry most intense when rivals are 'neck and neck' (similar sizes), or is it better for innovation if one of the rivals has a lot of catching up to do?' Dual questions in terms of market structure, are 'do we observe increasing dominance or perpetual leapfrogging?' Again, Vickers has a major voice. For example, Aghion, Harris, Howitt and Vickers (2001) investigate the 'escape from competition' motive for innovation. This is the possibility that increased competition can stimulate R&D by increasing the incremental return from innovating. In other words, given that there will be a displacement

²⁹ Richer models might allow for different types of innovation and the necessary complementary assets required to bring the product to the market. For example, a rival that is outside of the market may be more flexible to adopting a new approach but may be disadvantaged by not having the necessary complementary assets to bring the product to the market. On the other hand, some innovations may require new ways of thinking and new complementary assets which could put the incumbent – that has (say) already committed itself to a mode of production – at a disadvantage. Under this approach, innovation and market structure might be viewed as an evolutionary process. Even so, the mere existence of potential competition from a rival would seem likely to be conducive to innovation.

effect (whoever wins), is it better that incumbents act more or less competitively to each other? In general, the authors find that innovation is faster for more competitive regimes, but that 'a lot of imitation' is always bad for growth³⁰.

- 4.32 A more unequivocal message emerges from Bessen and Maskin's (2000) model, which examines the roles of patent protection and imitation in markets where innovation is both sequential and *complementary*. Precisely because subsequent innovations are often complementary (ie building on each other), certain types of imitation can actually expand the market for the initial innovation. Although imitation reduces the initial innovator's current profit, it raises the probability of further innovation and so enhances the likelihood of the original innovator making another profitable discovery later on. As such, this increases the expected profitability of the initial innovation. They argue that this prediction – that greater competition *enhances* the incentive to innovate – is supported by evidence from the US computer industry.
- 4.33 In another related, recently published paper, Boone (2000) provides a clear example of how theorists are now concentrating their attention on 'what exactly do we mean by competition?' He attempts to provide a framework in which some of the conflicting theoretical results of the effect of competition and productivity can be viewed. Assuming profits are a function of own costs, rivals' costs and 'competitive pressure', Boone categorises firms by how their profit functions are related to changes in the level of 'competitive pressure', ie 'how aggressive the interaction is between firms'³¹. For example, when firms are moderately efficient, an increase in competition may strengthen the inverse relationship between their costs and their profits. Thus, they will have stronger incentives to invest in innovations which reduce costs. On the other hand, where firms are either very inefficient or very efficient the effect may go the other way. In the former case, increased competition may accentuate the firm's weak position compared to others in the industry, so that it is not worthwhile investing in lower production costs because the expenditure required to catch up with its rivals is so great. In the latter case, the firm may be so far ahead that an increase in competition accentuates its cost advantage and so avoids the need to invest in lower costs.

³⁰ In our opinion, this is the analogue of Arrow's displacement effect: competition encourages innovation because it does not displace the innovator's existing profit which (under perfect competition) is zero. Compare also the standard patent race model where potential innovators are outside firms and so their existing profit is zero. Work is still ongoing on the effects of competitive pressure on the incentives for neck-and-neck firms or laggards to innovate, see for example, Encaoua and Ulph (2000).

³¹ For example, Bertrand competition is more aggressive than Cournot competition in an homogenous goods industry.

- 4.34 Drawing the threads of this review of theory together, our working conclusion is that most static analysis tends to weigh somewhat in favour of competition as efficiency-enhancing, and the balance of more dynamic analysis also tends to point in the same direction (if perhaps less conclusively).

The empirical literature

- 4.35 Unfortunately, the empirical literature is voluminous, difficult to synthesise, and often atheoretical. We shall not attempt a comprehensive survey here. Instead, we opt for a selection of key papers, as representative of the literature as a whole. They are 'key' in the sense of being, themselves, surveys, or of representing what we consider to be 'best practice' of their type.

CONVENTIONAL REGRESSION-BASED STUDIES

- 4.36 As is true for many topics in applied industrial organisation, the majority of research papers employ cross-section or panel analysis of industry, but sometimes firm-level, data.

A recent survey

- 4.37 Perhaps an obvious starting point is Haskel's (1996) survey for OFT. He concentrates on the (largely econometric) literature relating competition to productivity or productivity growth, referring to approximately 30 papers written in the 1980s and 1990s. Arguably, productivity (levels and/or growth) is sufficiently broad to encompass both static and dynamic efficiency (insofar as the effects of innovation should be revealed by productivity). He draws four conclusions from his survey (p.33):

- 'Frontier (production function) methods show no straightforward link between competition and efficiency. But they suffer from theoretical and statistical problems such that the lack of a relationship is not very informative one way or another.
- Production function estimates support the view that an increased level of competition raises the level of productivity. This finding depends strongly on how controlling (sic) for the endogeneity of competition measures.
- Increased levels of competition do appear to raise productivity growth, but the evidence here is very thin.
- We have almost no evidence on the extent to which competition removes the worst performing firms from the industry or promotes new entrants.'

Two studies on competition and productivity

4.38 One of the most widely cited studies of the last decade is Nickell (1996). This is probably the best known of the papers surveyed by Haskel. Nickell starts by drawing attention to some pieces of 'broad-brush' evidence on the power of competition to increase productivity growth: (i) the low levels of productivity growth in (pre-transition) Eastern Europe, compared to Western Europe, (ii) Porter's (1990) demonstration of the key role of internal competition in generating industries which perform well on the world stage, and (iii) the significant productivity gains after deregulation of US airlines. He moves on to summarise the previous, more formal, econometric literature, and concludes as follows:

there is some evidence that competition is good for technical efficiency, total factor productivity and innovation. Formal evidence is, however, very thin... and there is very little useful econometric evidence on the more interesting relationship between competition and productivity growth.

4.39 In his own research, he attempts to fill the gap with an analysis of productivity growth in a sample of 670 UK firms, over the years 1972-86. His main findings are that market power is not conducive to high productivity, and competition is associated with higher productivity growth. Most commentators have used this as important, more or less contemporary, evidence in favour of competition. Indeed, for present purposes, one might use the estimated coefficients of his equations to speculate on a ball-park figure for how much, in a particular case, productivity (growth) could be enhanced by introducing more competition, or by preventing a reduction in firm numbers or by reining back the market power of leading firms. In our opinion, however, this would be incautious, if only because the aggregate nature of his study leaves some of his proxy measures necessarily open to some doubt³².

4.40 Subsequent to his survey, Haskel with Disney and Heden (2000), has analysed the UK ARD panel of establishments to find that market competition (measured by lagged changes in market share and lagged changes in rents) raises both the level and growth of productivity, and that this finding is robust to selectivity correction. They note that studies which do not correct for selectivity (including Nickell, *op.cit.*) *overstate* the magnitude of the competition effect. Furthermore, 50 percent of labour productivity and 90 percent of total factor productivity in their sample was accounted for by 'external' restructuring effects, whereby

³² For example, market power is measured by market share, whilst a Demsetzian view would interpret large market shares as indicative of higher efficiency; competition is measured by numbers of competitors, but without taking into account their relative sizes.

multi-establishment firms close down poorly performing plants and open up higher performing new ones. The latter effect is arguably a form of competition acting as a 'selection' mechanism.

Two studies on competition and innovation

- 4.41 Geroski's study (1990) is one of the best known studies on the relationship between competition and innovation. He uses panel techniques, on UK data at the industry level through the 1970s, to investigate the relationship between seller concentration (and other traditional measures of market power) and measures of the rate of innovation. In broad terms, his results are consistent with an inverse causal relationship, ie indicating a positive role for competition.
- 4.42 Blundell et al (1995) apply count data models to firm level panel data and find that concentration has a dampening effect on innovation. While the authors find that large firms tend to innovate more, industry concentration has a counteracting effect. For a given market size, a higher market share for one firm (and hence more innovation) is exactly offset by a lower market share for another (and hence less innovation). However, if the higher market share also leads to higher concentration, aggregate innovation will tend to fall. Thus the authors conclude: 'antitrust authorities should remain wary of arguments that monopoly power is the price of a dynamically efficient economy'³³.

THE EFFECTS OF PRIVATISATION AND DEREGULATION

- 4.43 As mentioned in the introduction to this chapter, one might argue that programmes of deregulation, privatisation (if accompanied by liberalisation), and trade liberalisation offer an alternative route to estimating the potential for efficiency gains from introducing competition into markets where initially it was absent.
- 4.44 It is not difficult to identify individual studies in which estimates of such gains have been substantial. For instance, Haskel and Szymanski (1992) found significant increases in annual productivity growth for a range of privatised firms; Szymanski and Wilkins (1993) report a 20 percent reduction in unit costs

³³ A very recent study, which has come to our attention only at the editing stage of this report, provides important new evidence suggesting an inverted 'U-shaped' relationship between the rate of innovation and the degree of product market competition. Aghion et al (2002), drawing on the theoretical strand associated with Aghion et al (2001) in section 4.2.4, find evidence from data on the patenting activity of UK firms, that innovative activity first increases with the intensity of competition, before then tailing off once competition becomes very intense. This 'inverted U' is reminiscent of the predictions of the older Structure-Conduct-Performance school (see, for example, Scherer (1965).)

in local government refuse collection, following competition; Heseltine and Silcock (1990) report a 30 percent reduction in unit costs in local buses in English Metropolitan areas.

- 4.45 Moving from the specific to the general, a recent survey by Megginson and Netter (2001) is arguably the most comprehensive survey of the empirical literature on the effects of privatisation. Unfortunately, for our purposes, their emphasis is on isolating the influence of changed ownership, rather than liberalisation. Nevertheless, they do conclude, *en passant* in a short passage (section 3.1.1, p329), that the impact of privatisation appears to depend on the degree of market failure, with the case for privatisation being most compelling in competitive markets or markets which can readily become competitive.
- 4.46 Another survey, by Gonenc et al (2000), provides a review of empirical studies of product market liberalisation and performance which is more pertinent for our purposes. They conclude that, on balance, liberalisation leads to positive growth effects at the macro level, and led to lower prices, greater efficiency and higher quality in air travel, road freight, telecommunications, electricity and rail freight³⁴.

TRADE LIBERALISATION

- 4.47 An additional perspective is provided by papers investigating the relationship between productivity and import competition, or liberalisation measures which open industries to increased trade. We might expect trade liberalisation to increase competition if lower trade barriers increase product market competition from foreign firms and reduce entry barriers. Of course, trade liberalisation may be contemporaneously associated with other reforms which impact positively on the competitive environment. However, to the extent that such liberalisation does increase competition, we might note the empirical review by Greenaway et al (1998). They conclude that, when dynamic effects are incorporated into the empirical models, liberalisation and the openness of the economy impact favourably on GDP growth per capita, although the effect is likely to be lagged and modest.

³⁴ Their Table 1 (pp.61-4) provides a comprehensive tabulation of previous studies and their qualitative findings.

THE EFFECTS OF MERGERS ON PRODUCTIVITY

- 4.48 Given the focus on mergers in subsequent chapters of this stage 1 report, we have also scrutinised the literature for previous empirical studies on the effects of mergers on productivity and/or innovation. In fact, such a literature appears to be extremely thin. This is borne out by Roller et al's (2000) survey: on productivity, they unearth a small number of papers which, taken together, reveal no generally robust results³⁵; on innovation, they report (p. 53) 'Unfortunately we are not aware of any empirical studies that focus on the effects of merger on technological progress.'

Conclusions

- 4.49 Before returning to our three starting questions, it must be acknowledged again that the survey in this chapter has not been exhaustive and is largely derivative. Although we have aimed for a representative selection of references, precisely because it is only a selection, it can be contested.
- 4.50 With this qualification, our reading of the literature suggests the following answers.

QUESTION 1

Is there reasonably conclusive support for the contention that increased competition leads to improvements in 'efficiency?'

ANSWER 1

Even without the benefit of much formal training in Economics, the 'person in the street', drawing on intuition and casual empiricism, might come up with the 'basic ideas' listed in our introduction. On balance, they would probably suggest that competition is a 'good thing' concerning efficiency broadly defined, but there are counter arguments even at the intuitive level. Deeper academic investigation, both theoretical and empirical, largely confirms that there are indeed two sides to the coin, but with the balance in favour of competition.

QUESTION 2

Can one point to 'typical' magnitudes of the efficiency advantages resulting from competition?

³⁵ A generic problem with research on this subject is disentangling efficiency improvements/deterioration from a scale (dis)economies effect.

ANSWER 2

Here the obvious answer is no. Even were all the arguments and results pointing in the same direction (which they are not), we have seen that the outcomes of introducing more competition in any particular case will be case specific. It is true that some specific case studies report sometimes very large cost savings (at least 20 percent) from the introduction of competition; it is also true that other, more general, cross-industry econometric studies could be used to calibrate likely cost savings or productivity improvements in particular instances (given knowledge about their market characteristics). However, the former are obviously very case-specific, and the latter approach would be to attach too much credibility to what are likely to be fairly non-robust coefficients.

QUESTION 3

Are there suggestive pointers as to what the practitioner might look for in any particular case?

ANSWER 3

Certainly, the literature, especially on the theoretical side, provides some useful insights. Some are essentially cautionary: for example, a crude equation of the degree of competition to some standard measure of seller concentration can be misleading and to miss the essence of what competition really is. Similarly, when appealing to yardstick competition, we need to be sure that like is being compared with like. Others provoke thought, although not always an answer: is it better, for competition, that market leaders are of roughly the same size, or is it better for incentives that there are asymmetries?

- 4.51 Relating these answers to the task in hand, we advocate a cautious approach. First, it should be acknowledged that, in any particular case of antitrust intervention, there may well be significant implications for efficiency, and these should certainly be explored on a case-by-case basis. However, they will only be of relevance to consumer savings insofar as cost savings are passed on, or if there are implications for future product quality and choice (product innovation). Second, we suggest that it is not advisable to make any broad-brush estimate of the effects of cost savings when deriving a global estimate of 'consumer savings from OFT activity'. Given that we believe that competition is on balance efficiency-enhancing, this does mean, of course, that we will *underestimate* the net consumer savings from policy. Nevertheless, this is in keeping with the general stance that we develop throughout this report, namely, that estimates are best thought of as in the spirit of a lower bound.

5 CARTELS: BY HOW MUCH DO THEY RAISE PRICE, AND HOW LONG DO THEY LAST?

Introduction

5.1 In this chapter we look at the empirical evidence on cartels³⁶. We distinguish between two types of cartel: 'hard-core', in which firms *explicitly* collude – for example they may all formally agree to fix prices, to share markets, to stick to agreed quotas, to rig bids or to a combination of these practices; and 'soft' cartels, which occur when firms follow an implicit agreement or *tacitly co-ordinate*. This chapter focuses solely on explicit or hard-core cartels. We review empirical studies of the effects of price fixing. We then consider empirical evidence on the probability of detecting a cartel, and on how long cartels might be expected to last.

By how much can cartels increase price?

5.2 This section presents a selective literature review which aims to give a representative picture of the available evidence and raises some of the measurement issues that arise.

EVIDENCE FROM US BID RIGGING CASES

5.3 Froeb, Koyak and Werden (1993) noted that in the five years to 1993, 70 percent of the cartel cases investigated by the US Department of Justice (DoJ) involved bid rigging rather than price fixing, bid rigging in government procurement being typical. Perhaps for this reason, much of the empirical literature on the effect of cartels concentrates on bid rigging. While there are exceptions, in general, the evidence suggests that cartels lead to prices well in excess of 10 percent, and sometimes in excess of 20 percent, of competitive levels.

School milk markets

5.4 Some recent papers refer to bid rigging cartels in school milk markets. These markets lend themselves to collusion for several reasons set out in Porter and Zona (1999)³⁷:

³⁶ Although this stage of the report will not include any work of our own on cartels, this chapter is included as background reference for possible future work at a later stage.

³⁷ Carlton and Perloff (1994), Chapter 6 also highlights these factors which facilitate cartel formation.

- price competition is the only dimension of competition,
- demand is inelastic and stable³⁸,
- firms face similar costs of production³⁹,
- building a new plant would be unattractive solely on the basis of higher margins made on school milk contracts, and this reduces the scope for new entry,
- markets tend to be concentrated and localised (transport costs reduce the scope for supply side substitution) which facilitates market sharing,
- the 'game' is repeated year by year and multi-market contact is enhanced by disaggregated contracts staggered throughout the year⁴⁰,
- although tendering is by sealed bid auctions, immediately after contracts are won, bids and bidders are made public so cheating can be observed,
- competitors can obtain each other's list prices for sales of milk to retail customers which may facilitate signalling, and
- parties often meet through trade associations or by being customers of each other.

³⁸ Bid rigging is most commonly found when the public sector is the buyer. Typically demand is inelastic because the tender must be awarded. Thus higher bid prices do not reduce the quantity purchased, so long as the price is not so high as to exceed the available budget.

³⁹ The more similar are conspirator firms and the products they produce, the more likely they are able to agree on what the collusive strategy should be and how the excess profits should be split. This is because their individual incentives are more likely to be aligned.

⁴⁰ Both Pesendorfer (2000) and Porter and Zona suggest that if milk contracts were put out to tender in bulk, and on the same day of the year, the scope for collusion would be diminished.

5.5 Table 5.1 summarises the estimates of by how much bid rigging has increased prices.

TABLE 5.1 – THE EFFECTS OF BID RIGGING CARTELS IN SCHOOL MILK MARKETS

<i>Study</i>	<i>Effect of bid rigging on prices or margins</i>	<i>Technique used</i>	<i>Notes</i>
Lanzilotti (2000)	Explicit collusion caused gross margins ⁴¹ to increase from 46.9 percent to 80.6 percent.	Comparison of margins in conspiracy period with price war period without controls for other factors affecting prices.	Stability of incumbency rates evidence that collusion was explicit and not tacit ⁴² .
Porter and Zona (1999)	Prices 6.5 percent higher.	Reduced form model of bidding behaviour used to compare control (where there was no collusion) and cartel group. Econometric analysis supports systematic differences between bidding strategies in the control group and the conspirator group.	Competitive bidding strategies imply that bid prices should increase the further the area to be supplied is from the milk plant but conspirator group submits relatively low bids for distant contracts and higher bids for contracts closer to their plants.
Pesendorfer (2000)	For the Texas cartel the mark up on raw milk is 18 percent higher than it would be under competitive bidding.	Regression of lowest bid prices on controls for demand and cost factors. Parameters for cartel group significantly differ compared to non-cartel group.	Evidence consistent with 'optimal' cartels in Florida and Texas, with the contract being awarded to the lowest cost cartel member.

⁴¹ This is a gross margin calculated as (winning bid price – raw milk cost)/raw milk cost.

⁴² In a response to Scott (2000) who argues that collusion was tacit and not explicit, Lanzilotti points out that the stability of incumbency rates (contracts retained in a following year) and the near equal partitioning of the overall market during the conspiracy period is strong evidence of explicit collusion. Incumbency rates were much less stable in non-conspiracy periods.

Other bid rigging cases in the US

5.6 The following table provides some examples of studies which attempt to estimate the effect of bid rigging in other US industries. The first five relate to rigged bids which allowed conspirators to extract higher prices from public sector buyers; the final study is an example of a buying cartel where conspirators were able to hold down prices; once again the public sector was the victim.

TABLE 5.2 – THE EFFECTS OF BID RIGGING CARTELS IN OTHER US INDUSTRIES

<i>Study</i>	<i>Effect of bid rigging on prices or margins</i>	<i>Technique used</i>	<i>Notes</i>
Froeb, Koyak and Werden (1993)	'A fairly typical bid rigging scheme is found to have raised prices by over 20 percent for over 4 years.'	Time series technique used on data from periods when there is no conspiracy used to forecast or 'backcast' what the price would have been in conspiracy periods absent collusion.	The conspiracy involved several types of seafood but good data only available for frozen perch filets. The price of fresh perch filets is used to control for shocks to demand or supply.
Howard and Kaserman (1989)	Average estimates range from around 26 percent – 40 percent of the total value of bids.	Comparison of 3 different types of empirical techniques: dummy variable, forecasting, 'ratio' approach ⁴³ .	Based on a small sample of bid rigging contracts for sewer construction (7 rigged and 39 unrigged contracts).
Nelson (1993)	25 percent-28 percent of the average bid price over the bid rigging period.	Similar to Howard and Kaserman (1989) above (but larger sample).	Estimates effect of bid rigging at an 'English' auction of used state police cars.

⁴³ The ratio approach divides the bid price by an engineer's estimate of the value of the project. For non-rigged bids this ratio should be lower on average than for rigged bids. The difference between the two ratios is the estimate of the percentage price hike resulting from collusion.

TABLE 5.2 *continued*

<i>Study</i>	<i>Effect of bid rigging on prices or margins</i>	<i>Technique used</i>	<i>Notes</i>
Simon and Werden (1987)	'A conservative estimate of the average price increase from price fixing is 10 percent.'	Survey of estimates of previous bid rigging conspiracies in road building.	Unclear to what extent these earlier studies were able to control for other factors which may have affected prices.
McMillan (1991)	'speculative analysis... suggests that the excess profits from collusion in a public-works project typically amount to 16 percent to 33 percent of price.'	Simulation based on a theoretical model of bidder behaviour and plausible parameter estimates.	Relates to bid rigging in Japanese public works contracts.
Baldwin, Marshall and Richard (1997)	Effect of the <i>buying</i> cartel is to lower prices by 7.9 percent overall. However, for a subset of bids where prices were within 5.5 percent of the reserve (minimum) price set by the Forest Service the loss from the cartel is 52.9 percent.	Estimate various bidding models to see which fit the data most effectively. Support for model that prices determined collusively.	Estimate the effects of a <i>buying</i> cartel on holding prices below competitive levels. The authors examine 108 oral timber auctions conducted between 1975 and 1981, where the US Forest Service sold timber from national forests.

5.7 There are also other, earlier studies of bid rigging in the US, but Froeb, Koyak and Werden (1993) note that their robustness is questionable for the following reasons:

- measurement error on account of the end of antitrust conspiracies not coinciding with the antitrust enforcement action as in Block et al (1981)⁴⁴, Lean et al (1985)⁴⁵ and Bosch and Eckard (1991)⁴⁶,
- problems in controlling for changes in costs and demand which could have caused price falls in the period following the end of the cartel (Erickson, 1976)⁴⁷, and
- studies used in private damage litigation which are inherently suspect.

Bid rigging cases in Europe

5.8 The European Commission imposed record fines for bid rigging in the Pre-Insulated Pipe cartel⁴⁸. The Commission does not provide a formal analysis of how much higher prices were during the periods when the conspiracy had effect. However, there is a suggestion that the cartel inflated prices in Denmark by 15-20 percent or more, while information from one of the cartel meetings suggests that prices in most other markets were inflated by the same amount.⁴⁹ Given the US evidence of bid rigging against the public sector, price rises of 15-20 percent would certainly be plausible.

⁴⁴ Also discussed in Chapter 8. Note also the criticism in Newmark (1988b) of Block et al's results.

⁴⁵ Lean, Ogur and Rogers (1985) examine the impact of collusion and antitrust conduct remedies in eight electrical equipment markets. In the industries considered there was a history of collusion during the 1950s in sales of certain products by sealed bid auction to government utilities. Antitrust enforcement began in 1959 and the conspiracies ended. The authors find that for insulators and circuit breakers profit/sales ratios were respectively 3 and 10 percentage points higher as a result of collusion. For five other industries the dummy variable for the conspiracy period is positive but not statistically significant. This suggests that the conspiracies failed to increase prices substantially. For turbine generators returns are *lower* during the conspiracy period (although note that other studies suggest that the conspiracy increased prices, see Carlton and Perloff (1994, p183).) However, there is some evidence to support the view that, in the 1960s, the change in pricing policies by General Electric Company and Westinghouse Electric Corporation facilitated tacit collusion and increased profitability by 4 to 11 percentage points.

⁴⁶ However, Bosch and Eckard attempt to control for leaks in information (eg due to a private damage suit) by checking the Wall Street Journal index for news of the conspiracy in the two years prior to the indictment. Bosch and Eckard is discussed in detail below.

⁴⁷ Erickson (1976) provides an account of bid rigging cartels in the gymnasium seating, rock salt and structural steel industries. In each case the public sector (eg schools, state highway departments), was the principal buyer. He provides rough estimates of the impact of the cartel on increasing prices which range from 7-60 percent and on inflating costs (perhaps 10-23 percent). He also argues that in each industry, even after the price fixing agreements, rivals were intimately aware of each others' costs and strategic incentives. This sowed the seeds of tacit collusion, which continued after the end of the price fixing agreements.

⁴⁸ Case No IV/35.691/E-4, Commission decision of 21.10.98.

⁴⁹ See paragraphs 125-6.

STOCK MARKET EVIDENCE

- 5.9 We now turn Bosch and Eckard's (1991) study based on stock market evidence. The authors attempt to estimate the profitability from price fixing by analysing the reaction of stock prices of 127 firms to announcements in the *Wall Street Journal* that they had been indicted for price fixing by the US Department of Justice (DoJ) between 1962 and 1980. It is likely that many of these were bid rigging cases⁵⁰.
- 5.10 Bosch and Eckard start by citing two earlier studies which find a fall in returns ranging from 0.6 to 1.1 percent, but which are unable to attribute how much of the fall is attributable to the market's estimate of the lost excess profits. The fall in value could be for various reasons: expected fines levied by the DoJ, expected legal costs (including treble damage awards), lost monopoly profits, or negative 'market signal' effects such as a tarnished reputation⁵¹. Bosch and Eckard themselves find evidence of a fall on the day prior to and the day of the announcement. They estimate the mean fall in returns as 1.08 percent, or \$2.18bn in 1982 US dollars. They attribute 13 percent of this to legal costs and provide evidence consistent with (although not strongly in support of⁵²) the view that the residual \$1.89bn is an estimate of lost monopoly profits from price fixing.
- 5.11 Bosch and Eckard derive a crude measure of sales in the relevant market by indicted firms to be \$18.3bn (1982 dollars) and compute a rough estimate of the lost mark up (lost annual profits divided by annual turnover) to be 9 percent (median 2.6 percent)⁵³.

⁵⁰ 'From the early 1950s through the early 1990s, U.S. antitrust agencies filed relatively fewer international cases than in previous decades, while enforcement efforts were more actively engaged in bringing domestic price fixing and bid rigging cases' (<http://www.usdoj.gov/atr/icpac/chapter4>, page 2). If the ratio of bid rigging to price fixing cases is similar to the 7:3 for 1988-93 (Froeb, Koyak and Werden, 1993) then we might expect that the majority of the DoJ indictments in the period were against bid rigging cartels.

⁵¹ Bosch and Eckard implicitly assume that investors are well informed and that the stock market is efficient.

⁵² The value loss implied by the negative return is found to be higher, the greater the revenue of the conspirator in the relevant 'conspiracy' market. Since most firms in the sample are multiproduct firms, a negative market signal effect should apply to the whole firm and so would not necessarily be correlated with sales in the conspiracy market. On the other hand, a lost monopoly profit interpretation would suggest that the value loss is inversely related to the conspirator's revenue in the conspiracy market (as Bosch and Eckard find). A negative market signal effect would benefit the competitors of the conspirator, whereas the lost monopoly profit interpretation implies lower profits for a conspirator's rivals, because competition becomes more effective. Bosch and Eckard find no effect on rivals, either positive or negative. However on balance the evidence supports the lost monopoly profit interpretation.

⁵³ For this calculation Bosch and Eckard assume that the market expects that the conspiracy would have lasted for 5 years and annualise the lost value for each firm accordingly. Their basis is that Bryant and Eckard (1991) report a mean duration of cartels of 5 to 7 years for a large sample of DoJ cases between 1961-1988. However, this is a somewhat arbitrary assumption. If the cartel had been in existence for say 3 years, then it might be more reasonable to expect it to have lasted only a further 2 years. This would give a much higher estimate of the lost margin.

5.12 Thompson and Kaserman (2001) take Bosch and Eckard's data to assess how long the negative returns lasted following an indictment. The authors note that Bosch and Eckard found significant negative excess returns for their sample on the day preceding and the day of the stock market announcement. Hence, taking the return two days before the stock market announcement (the t-2 return) to be their proxy for the market's valuation of the return from the conspiracy, Thompson and Kaserman consider how many working days it takes after the indictment to return to the t-2 level. The authors find that 85 percent of the sample of 122 firms regained the t-2 return within 300 working days, many of which recovering much more quickly. They argue that this is either an example of a weak deterrent effect or an example of how price fixing may have sowed the seeds of tacit collusion⁵⁴.

EVIDENCE ON PRICE FIXING CARTELS (EXCLUDING BID RIGGING)

5.13 There are fewer studies on the effects of price fixing cartels, and a selection is presented here⁵⁵. Some find that cartels do not increase prices at all, but others point to very high prices arising from price fixing cartels. Recent evidence from the DoJ presents some high profile international cartels which have significantly increased prices. Evidence from the European Commission is less clear. On balance we might not expect price fixing cartels to lead to higher prices as consistently as bid rigging cartels, but when they do, the price rises are often very large, well in excess of 10 percent.

i. US cases

5.14 Porter (1983)⁵⁶ examines the Joint Executive Committee, a cartel which controlled shipments (73 percent grain) from Chicago to the Atlantic seaboard in the 1880s. For those periods in which collusion was effective, he finds prices to be 68 percent higher and quantity 33 percent lower⁵⁷.

⁵⁴ This undermines the weight that we can place in Bosch and Eckard's (1991) results. However, unlike Bosch and Eckard, Thompson and Kaserman do not report diagnostic tests or consider how the valuations of other firms in the market were affected. Furthermore, although Bosch and Eckard try to control for information leaks, it is possible that the t-2 price had already taken account of some lost profits if firms had lowered prices as a result of investigation by the authorities as Feinberg (1984) suggests they might do. For example, Bosch and Eckard have a negative (but not significant) sign on excess returns at t-2 and t-3.

⁵⁵ While there are several empirical papers on cartel duration and the factors which facilitate cartel formation, there appear to be far fewer on how much cartels increase prices. As the survey paper by Evenett and Suslow (2000, p614) notes: 'The information researchers have gained relates to cartel duration or stability, rather than profitability or success.'

⁵⁶ Cited in Hay and Morris (1991).

⁵⁷ Porter infers the time periods of cooperation to be those which, given his data, assign the highest probability to his chosen system of equations for supply and demand being correct. The effective periods of collusion identified by Porter are not always consistent with the periods of collusion identified in historical accounts of the cartel.

- 5.15 Levenstein (1997) considers a cartel of US bromine producers between 1885 and 1914. She finds evidence that the conspiracy raised prices significantly. Prices were anything from 23 percent to 75 percent higher as a result of the conspiracy. She also notes that there were two types of price war over the whole period. First, there were price wars which were probably triggered as a result of imperfect monitoring of demand and supply shocks⁵⁸. These price wars did not represent a complete break down of the collusive agreement and prices did not fall to the non-cooperative outcome⁵⁹. Second, there were price wars where prices fell to non-cooperative levels (but never below marginal cost). She interprets these price wars to be a break down of the collusive agreement, brought about by the desires of the parties to renegotiate a better outcome for themselves in future agreements.
- 5.16 Feinberg (1984) examines a small sample of five price fixing cases indicted in the US. He considers whether antitrust enforcement has a deterrent effect which prevails in the same market that the indictment occurs. In other words, he addresses the question of whether, once a cartel has been uncovered and prosecuted, prices fall and *remain* at lower levels. Based on a (simplistic) regression to determine how prices in the industry of concern track a broader industry price index, Feinberg finds that in three out of five cases the antitrust effect is significant, with price falls of some 6.6-11.4 percent. The deterrent effect is found to last for five years but diminish a little over time (in three cases a deterrent effect of 3.4-8.9 percent remained after five years). Feinberg also provides weak support for the view that price fixing investigations disrupt conspiracies, with the effect that prices fall before the actual filing of the case.

⁵⁸ If prices fall then conspirators will not know whether this is a shock or whether one party has cheated. This leads to a punishment phase as argued, for example, by Green and Porter (1984). Levenstein argues that the punishment strategies were more complex than in Green and Porter's model. Sometimes they were firm specific. For example, a cheater would be fined an amount equal to the likely gain from cheating; this prevents a price war in the whole industry. She also notes that the damage to profits of price wars was made more severe by arbitraging across time. Bromine could be stored and so during a price war buyers stocked up on bromine in order to reduce the amount they would need to buy when prices rose in the future. This perhaps explains why price wars did not have to be very severe during the punishment phase.

⁵⁹ Making assumptions about demand and cost specifications, Levenstein models the prices that would be set in either a Cournot or Bertrand game. She refers to a one-shot Cournot outcome as the non-cooperative price level.

ii. UK cases

- 5.17 Lloyd, Morrissey and Reed (1998) use intervention analysis⁶⁰ to assess the impact of action taken by the European Commission both against dumping by Japanese firms (in August 1982) and against a cartel of European firms (in August 1986) in the polypropylene film industry. They assess the impact of dumping and cartel behaviour in the UK and argue that a conservative estimate of the effect of the cartel was to increase prices by 15 percent. They also find that the cartel was effective at restricting imports into the UK (perhaps due to market sharing). The authors suggest that, prior to the discovery of the cartel, European firms may have been rent-seeking. This is because, by lobbying the Commission to take action against dumping by Japanese firms, this allowed the cartel to bolster both prices and market share in Europe.
- 5.18 Symeonidis (2000), (see also Chapter 8), discusses the effect of the introduction of a law against cartels in the UK in 1956. The tougher stance against cartels increased price competition and led to lower margins, in the short run, in industries which had previously been cartelised. This suggests that the cartel agreements had inflated prices – at least in the short run⁶¹. He also cites earlier case studies which reported substantial price falls as a result of the new law, although he notes that these studies were not able to control for other factors that may have affected prices. These case studies also indicated that, prior to the new law, cartels had often set prices high enough to allow high cost firms to break even. This suggests that the cartels had inflated industry costs. Symeonidis' own results also suggest that, where antitrust laws intensify competition in industries where entry barriers are already low, welfare gains are likely to arise not through gains in consumer surplus but through gains in producer surplus⁶².

⁶⁰ Broadly speaking, the methodology assesses how an exogenous event (or 'intervention') whose timing and expected effect is known disturbs a time series. This technique has only modest data requirements. In this case the authors used a sample of import volume and unit value data long enough to support standard time series techniques and frequent enough to allow for economic interpretation. Since the technique picks up any shock to the series, economic interpretation is required to distinguish between shocks caused by the intervention of interest and other shocks.

⁶¹ The lower margins led to a shakeout. This meant that in the long run, as the number of firms in the industry declined, margins recovered.

⁶² Intuitively this is explained as follows. Free entry means that the cartel cannot prevent prices from rising (too far) above competitive levels. However, where cartels support excess entry there is wasteful duplication of fixed costs.

iii. International cartels

- 5.19 Eckbo (1976)⁶³ studied 51 formal international cartels over the period 1918 to 1964. A successful cartel, according to his strict (and somewhat arbitrary) definition, is one that raises price in excess of three times the marginal cost of the least efficient member of the cartel⁶⁴. 37 percent were 'successful' by this measure⁶⁵.
- 5.20 The oil price hikes of 1974 (which almost quadrupled prices) and 1979-80 are often attributed to the OPEC cartel. Carlton and Perloff (1994)⁶⁶ set out four competing theories which could explain the price rises: OPEC is a profit maximising cartel; OPEC is motivated by political objectives as well as profit objectives; Saudi Arabia behaves as a dominant firm; the oil industry is competitive. They argue that the evidence favours one or more of the first three theories, which provides further support for the view that cartels can have a significant impact on prices.

Examples from the literature of cartels which did not increase prices

- 5.21 Newmark (1988a) notes that: 'An open question is whether price fixing succeeds against other buyers⁶⁷. We have a small set of empirical studies that suggests the answer is no: conspiracies against unregulated, for-profit buyers do not raise prices significantly, if at all.' Newmark mentions that most of the conspiracies in the latter studies increased prices by 2 percent or less.
- 5.22 Sproul (1993) surveys 25 cases filed between 1973 and 1984 by the DoJ. Sproul seeks to address the question of whether prices fall after an antitrust indictment. He compares actual prices with predicted prices and argues that in his sample prices *rise* after an indictment. He provides two interpretations. The first is that antitrust remedies penalise efficient cartels which would otherwise have lowered industry costs (with lower costs being passed on as lower prices). Sproul's second interpretation is that fines were too lenient. This view is supported by the finding that higher penalties are correlated with lower prices.

⁶³ Cited in Carlton and Perloff (1994).

⁶⁴ This is a strict definition of successful, an 'unsuccessful' cartel in Eckbo's terms may well have increased prices. Note that if price, p , is three times marginal cost, c , then $(p-c)/p$ equals $2/3$. If the elasticity of demand exceeds $3/2$ then even a monopolist would not increase prices by three times marginal cost!

⁶⁵ Somewhat in contrast to Eckbo's view, Besanko, Dranove and Shanley (2000, p242) argue that: '[a] few cartels have had short-term success, such as bauxite and uranium, and one or two, such as the De Beers diamond cartel, appear to have enjoyed long-term success. In general, however, most international cartels are unable to substantially affect pricing for long.'

⁶⁶ Pages 214-228.

⁶⁷ ie buyers other than the public sector.

Evidence from the US competition authorities

- 5.23 In its sentencing manual, the DoJ uses a benchmark that on average cartels produce a 10 percent rise in price and that harm to society may be around 20 percent of the volume of commerce⁶⁸. The view of some DoJ officials is that the 10 percent price rise may be conservative. This is in part due to the greater focus in recent years on international cartels which has met with significant success, uncovering some wide ranging cartels which increased prices well in excess of 20 percent⁶⁹. These are set out in the table over the page.

⁶⁸ The Department of Justice Sentencing Guidelines Manual, November 98 state that: 'It is estimated that the average gain from price fixing is 10 percent of the selling price. The loss from price fixing exceeds the gain because, among other things, injury is inflicted upon consumers who are unable or for other reasons do not buy the product at the higher prices. Because the loss from price fixing exceeds the gain, subsection (d) (1) provides that 20 percent of the volume of affected commerce is to be used in lieu of the pecuniary loss...' (page 231). It is not clear what 'loss from price fixing' is being referred to. In theory, a 10 percent price hike is unlikely to produce an additional deadweight loss of 10 percent.

⁶⁹ The following table draws on <http://www.usdoj.gov/atr/icpac/chapter4>, DoJ (2000) and OECD (2000). We have not been able to uncover the methodology used to estimate the effects of cartels on prices although we note that indicted firms generally pleaded guilty to their involvement in the cartel.

TABLE 5.3 – EXAMPLES OF INTERNATIONAL CARTELS PROSECUTED BY THE DoJ

<i>Cartel</i>	<i>Estimate of price rise</i>	<i>Duration</i>	<i>Estimate of turnover</i>
Citric Acid.	List prices raised to US customers in excess of 30 percent.	July 1991-June 1995.	App. \$1.2bn (annual worldwide turnover at time of prosecution).
Lysine.	70 percent in first months of conspiracy, eventually doubling prices for 3 years.	June 1992-June 1995.	App. \$600m (worldwide).
Graphite Electrodes.	50 percent (various markets).	c.1992-1997.	App. \$1.7bn of US sales.
Vitamins.	Perhaps 20-50 percent.	1990-1999.	App. \$3bn ⁷⁰ .
Two cartels under investigation ⁷¹ .	60 percent and 20 percent.	Not known.	Over \$1bn and App. \$750m respectively.

5.24 The effects of the Lysine cartel is debated by Connor (2001) and White (2001). These authors debate the duration of the cartel and how severe it was. A key part of the debate centres around the appropriate 'but-for' price (ie what the price would have been absent anti-competitive behaviour). Connor argued that the competitive price was ADM's long run marginal cost, ie the competitive benchmark is determined by Bertrand price setting (lysine producers produced a largely homogenous good). White, on the other hand, argued that absent any formal collusion the concentrated structure of the market and entry barriers favoured Cournot behaviour so that prices would have been somewhat higher than marginal cost. The data were not amenable to a more sophisticated econometric study. Even on White's analysis (White was representing ADM who pleaded guilty), the cartel lasted 18 months with

⁷⁰ Estimate from Suslow and Evenett (2000). It is worth noting the record fines levied on the conspirators. This was the largest cartel ever uncovered by the US authorities and resulted in fines of \$500 million on F. Hoffmann-La Roche (the largest criminal fine ever obtained by the DoJ on in any criminal matter) and \$225 million on BASF. In September 1999, these two firms, Rhone-Poulenc and three others agreed to settle civil claims brought by numerous corporate customers for \$1.1 billion.

⁷¹ <http://www.usdoj.gov/atr/icpac/chapter4> page 30.

a likely effect of raising prices by over 25 percent. Under Connor's approach the cartel lasted 31 months and at its height, for the year 1994, raised prices by well over 50 percent.

European Commission evidence

- 5.25 Apart from the pre-insulated pipes case, which was a bid rigging cartel, we have not found estimates for how much higher prices were as a result of collusion in the following recent cartel cases considered by the Commission. However, in two cases the impact on prices was not reported to be significant⁷².
- 5.26 In *British Sugar*, it is argued that a series of meetings between four UK sugar producers had led to collusion, with British Sugar acting as price leader. However, the Commission notes that it was: 'not able to determine the precise anti-competitive effect of the meetings in terms of exact price levels in the market...'⁷³.
- 5.27 In *Alloy surcharge*, collusion was facilitated by the use of a pricing formula and the Commission obtained documentary evidence that producers informed each other of future surcharges. Since the alloy surcharge accounted for up to 25 percent of the price of the final product and the colluding parties accounted for 90 percent of the market, the effect of collusion was deemed appreciable⁷⁴.
- 5.28 Castellot (2000) reports on other recent cartel cases. He notes that the impact of the infringement on the market was limited in *Seamless Steel tubes* and *Greek Ferries*. He also notes the Commission decision on the *Amino Acids* cartel, which was that part of the *Lysine* cartel (described above) which fell within the Commission jurisdiction.

⁷² Neither did a recent survey by the OECD (2000) of hard-core cartels provide any formal analysis of how much cartels increased prices. It reviewed some of the US cases cited earlier and noted a few other cartels discovered in Europe. For example, it reported that a Spanish sugar cartel raised prices for many years and that, as a result, prices in Spain were 5-9 percent higher than in the rest of Europe.

⁷³ Cases IV/F-3/33.708-711, Commission decision of 14.10.98, paragraph 123.

⁷⁴ Art (1999). This suggests that there was no formal analysis of the price effect carried out.

Probability of detection and duration of cartels

- 5.29 We are aware of one study which estimates the probability of detecting a hard core cartel to be at most 13-17 percent⁷⁵. There are more studies of cartel duration. These find that there is a wide dispersion in the length of cartels from 1-2 years to over a decade. However, it seems that the typical cartel lasts around 5-6 years⁷⁶.
- 5.30 Bryant and Eckard (1991) estimate the probability that a price fixing agreement will be caught and prosecuted by the DoJ to be at most 13-17 percent in a given year⁷⁷. Their calculations are based on applying a statistical birth and death process model to a sample of 184 indictments, 1961-1988 (many of these would probably be bid rigging cases). They estimate that the average conspiracy lasts about 5-7 years, and about seven new conspiracies arise each year. No data, of course, exists for uncaught conspiracies. Bryant and Eckard argue that 5-7 years is a lower bound for cartels that are undetected, if detected cartels last *no longer* than an uncaught conspiracy.
- 5.31 If 5-7 years is a lower bound then one might suppose that cartels which are not detected last longer than those which are detected – perhaps because they are better able to keep themselves secret, or because their industry is better suited to cartel survival. On the other hand, we might argue that the longer a cartel lasts, the more likely it is to be detected. For example, if we assume, based on Bryant and Eckard's results, that the annual probability of getting caught is 15 percent and is independent of how many years the cartel has been in operation, then a cartel remaining intact over a five year period has a probability of being caught of around 56 percent. In other words, it might be that on average uncaught cartels have a *shorter* lifespan than caught cartels. They are not caught because they break up before they are detected.

⁷⁵ However, it is worth noting that during the 1990s the DoJ Antitrust Division stepped up its efforts to detect and prosecute cartels, introducing an amnesty programme in 1993 and making aggressive enforcement against international cartels a top priority in 1995. This policy met with a great deal of success – with prosecutions of nearly 20 international cartels and the imposition of record fines for indicted corporations and record fines and jail sentences for indicted individuals. This suggests that the probability of detection and also the deterrent effect increased during the 1990s. The DoJ leniency policy should also be noted which provides incentives for cartel members to come forward and provide information on the existence of cartels in return for amnesty or reduced fines. This policy has been reported to have increased the detection of cartels from one a year to two a month. The DoJ notes that while the effectiveness of their antitrust policy has no doubt increased, it is possible that in the 1990s there were more cartels formed which in part led to the higher numbers detected.

⁷⁶ Here we do not consider what factors facilitate cartels and cartel stability, see Evenett and Suslow (2000) for a survey.

⁷⁷ Survey evidence suggests that the probability of detection is low, see Chapter 8.

- 5.32 Evenett and Suslow (2000) report that, for pre-WWII international cartels, the mean length of cartels is 4-8 years. This draws on earlier work, for example Suslow (1998)⁷⁸ who examines the stability of 72 international cartels in 47 industries in the period 1920-39. She finds the median length of the cartel to be 5 years. 75 percent of cartels lasted at least 2 years and 20 percent lasted more than 10 years. For more recent international cartels Suslow and Evenett report the mean to be 4-5 years (bid rigging cartels are excluded from the analysis). However, they note that the 'variance in duration... is most striking'.
- 5.33 Evenett and Suslow's work also draws on Eckbo (1976) who finds that, excluding an iodine cartel which lasted 61 years, the median duration for successful cartels was 5 years, the mean 6.6 years and the range 2 to 18 years, with less than 25 percent lasting longer than 10 years (based on a sample of 18 cases)⁷⁹.

Summary and Concluding Comments

- 5.34 Theory suggests that collusive strategies can deliver prices from anywhere between the competitive and the monopoly level. The empirical studies surveyed here have confirmed that, even for similar industries, there is a wide range in the price hikes arising from cartel behaviour and probably a multitude of different collusive strategies which underpin the cartels. Nevertheless, it is possible to make some generalisations. Bid rigging cartels are typically found where there is a public sector buyer. In general, albeit with exceptions, the evidence suggests that bid rigging leads to prices well in excess of 10 percent, sometimes in excess of 20 percent, of competitive levels. While price fixing cartels tend not to lead to such consistently higher prices, when they do, the price rises are still often very large, well in excess of 10 percent.
- 5.35 A few studies address the effect of cartels on costs. Some cartels which raise prices nevertheless allocate output mainly to the least cost firms; however, some allow relatively inefficient firms to survive, and so inflate industry costs. Even in markets with low entry barriers, cartels facilitate excess entry which inflates total industry expenditure on fixed costs.
- 5.36 The probability of detection is probably quite low, and has been estimated to lie between 13 percent and 17 percent, in a given year. Studies of cartel duration find that there is a wide dispersion in the length of cartels, from only 1-2 years to over a decade. However, it seems that the typical cartel lasts around 5-6 years.

⁷⁸ Cited in Carlton and Perloff (1998), page 144.

⁷⁹ Note that Eckbo's definition of 'successful' means that the cartel raised prices by at least three times the marginal cost of the least efficient member.

5.37 Even when indictments lead to lower prices, prices may nevertheless remain above truly competitive levels. Industries with a history of collusion, or with conditions favourable to collusion, may also be susceptible to tacit collusion. Indeed, sometimes price wars reflect a punishment phase in the cartel and not an end to the conspiracy.

PART III: A PROPOSED APPROACH TO MERGERS

6 THE US APPROACH TO QUANTIFYING POTENTIAL PRICE RISES IN MERGER CASES⁸⁰

Introduction

- 6.1 This chapter fulfils one of the key aims of stage 1, which was to review and explain the US approach (ie that of the antitrust agencies) when quantifying potential price rises following a merger. We were asked to include in this review the use of (i) relatively precise estimates (where the data are available), (ii) conservative ‘guesstimates’ and (iii) simulation techniques.
- 6.2 First, we highlight some important references made by the FTC and the Department of Justice (DoJ) to how their consumer savings estimates are derived. Second, we highlight the Staples/Office Depot case as an example of where detailed consumer savings estimates can be made.
- 6.3 The remainder of the chapter is then devoted to simulation.⁸¹ Third, set the scene, we provide an overview of the academic industrial organisation (IO) literature on mergers over the last decade. This literature has proved remarkably productive in informing policy – not least in helping to distinguish unilateral and coordinated effects, and in clarifying the extra issues involved when products are differentiated. Since the *precise nature* of differentiation turns out to be quite crucial when evaluating the effects of mergers when the parties supply different versions (brands) of the product, this paragraph also provides a quick tour of the alternative modelling approaches to differentiation, but now with the emphasis on econometric work. Fourth, we turn to the simulation methodology, explaining what it entails in practice. This paragraph also surveys a number of specific cases where it has been used.

⁸⁰ Throughout, we are concerned exclusively with horizontal mergers.

⁸¹ There is no reference in the FTC quote to the simulation approach, but DoJ and other sources refer explicitly to its use. One of the clearest expositions is in Shapiro’s address (1995) to the American Bar Association. At the time, Shapiro was the Deputy Assistant Attorney General at the Antitrust Division of the Department of Justice. More specifically in the context of the present project, John Parisi of the FTC, (letter to Adrian Majumdar of April 3, 2000), identifies the simulation approach with the work of, for example, Baker (1997) and Werden and Froeb (1996).

- 6.4 Since simulation is typically a very demanding approach (in terms of data and research time), a natural question to ask is whether ‘watered down’ rules of thumb might be applied, which are reasonably theoretically aware, but much less costly to apply. One such rule of thumb, due to Shapiro, is described in our fifth paragraph.
- 6.5 The final section concludes by taking forward the main messages to be applied in the next chapter when we consider the possibilities for applying some of these techniques in UK policy practice.

Starting point⁸²

- 6.6 Here we set out what we understand to be the US approach to horizontal merger cases. An appropriate starting point is to recount statements by the FTC and the DoJ in relation to their estimates of consumer saving. FTC’s plan, 1997-2002 (p.23) states the following:

For the maintaining competition mission, estimates of consumer savings take into account three principal factors: (1) the volume of commerce in the markets affected by a merger or other anti-competitive practice, (2) the percentage increase in price that likely would have resulted from the merger or other anti-competitive practice absent enforcement action, and (3) the likely duration of the anti-competitive price increase. In some cases, detailed pricing data or other information will enable the calculation of a relatively precise estimate of the likely price increase⁸³. In other cases, an estimate can be derived from the analytical method used to identify the relevant market. In these cases, the agency will conservatively estimate that at least a 1 percent anti-competitive price increase would occur absent enforcement action, and that the anti-competitive price increase would have lasted for two years absent agency action. These assumptions are based on the analytical guidelines used by the FTC and the Department of Justice to determine when to challenge a horizontal merger. Under those guidelines, the agencies identify markets where prices could increase by at least 5 percent before a significant number of consumers would turn to substitutes outside that market, and where entry by other firms to deter

⁸² This section has benefited from meetings with FTC and DoJ staff, which occurred during an OFT visit to Washington in November 2000.

⁸³ For example, on occasion, a firm’s own documents may show the amount by which it believes it could raise prices after the merger. Customer interviews may provide their views on the likely amount of possible post-merger price increases. In other cases, however, the harm that would result from a merger or other practice is not necessarily an immediate price increase but some other restriction on competition, such as the blocking of innovation that promises new or better products in the future. It is much more difficult to calculate a dollar estimate of consumer savings in such cases, and the agency generally will not attempt to do so.

anti-competitive pricing is unlikely to occur for at least two years. In almost every case where the FTC challenges a merger of competitors, both of these factors – as well as others – will apply. Both the ‘1 percent price increase’ and the ‘2-year duration’ for the price increase are conservative assumptions; where detailed facts are available, far greater consumer savings may be shown⁸⁴.

6.7 Turning to the DoJ, the following is taken from its Antitrust Division’s Congressional Submission for Fiscal Year 2001 (pages 78-9):

It is difficult to fully or precisely capture in a single number, or even a variety of numbers, the ultimate outcome of our Merger Enforcement Strategy. It is not always clear just how far-reaching the effects of [a] particular proposed or actual transaction are or will be. It is not always possible to determine the magnitude of a price increase that relates directly to [a] particular proposed or actual transaction. We cannot consistently translate into numbers the competitive impact of a particular proposed or actual transaction nor can we gauge the deterrent effects of our Enforcement efforts, though we and those who have written on the subject believe that such effects exist and are strong. Nonetheless, we believe that an end outcome, if not the ultimate outcome, of our work in this area is the Savings to US Consumers that arise from our successful protection of competition in the US economy and our deterrence of anti-competitive behaviour. Our estimates of consumer savings derive initially from our best measurement of volume of commerce in the relevant markets with which we were concerned. For the majority of merger matters, we calculated consumer savings by also using a formula drawn upon previously by Division economists to calculate consumer savings for FY 1994 wins. That formula makes a realistic assumption about the oligopolistic interaction among rival firms and incorporates estimates of pre-merger market shares and of market demand elasticity. In a few merger wins, primarily vertical mergers and those in which the anti-competitive effects included predicted reductions in innovation or other special considerations, it would not have been appropriate to apply that formula. For those wins, we developed conservative estimates of consumer benefits drawing on the details learned in the investigation. We note that the volume of commerce component of the calculation is estimated based

⁸⁴ The conservative default parameters of a 1 percent price increase for two years may underestimate significantly the likely consumer savings in some cases. For example, in the Staples/Office Depot merger case, agency staff estimated, based on company data, that the merger would result in consumer losses totalling approximately \$1.1 billion over a five year period – that is, about \$200 million per year. The conservative default estimate would have been \$24.75 million over two years – a little more than \$12 million per year.

on the best available information from investigative and public sources, and it is annualised and confined to US commerce. Despite the roughness of our initial methodology, we believe our consumer savings figure to be a conservative estimate in that it attempts to measure direct consumer benefits. That is, we have not attempted to value the deterrent effects (where our challenge to our expression of concern about a specific proposed or actual transaction prevents future, similarly-objectionable transactions in other markets and industries) of our successful enforcement efforts. While we believe that these effects in most matters are very large, we are unable to approach measuring them. Although there clearly are significant limitations to this estimate (as with any estimate), we believe it goes a long way toward describing the outcome of our work and ties directly to our Vision of an environment in which US consumers receive goods and services of the highest quality at the lowest price, and in which US businesses compete on a level playing field.

- 6.8 Our reading of these statements is as follows. Consumer savings estimates will be made where mergers are successfully blocked or abandoned as a result of investigation. Where data permit, sophisticated measurements of consumer savings are made. Where such data are not available, an estimate will be made using either a oligopoly model or, if all else fails, a *default measure* that consumer savings are equal to 1 percent of the turnover of the merging firms.
- 6.9 In the case of the default estimate, the DoJ assumes that consumer savings would last for one year whereas the FTC assumes they would last for two years. In both cases, the US authorities consider the default estimates to be conservative. There is some suggestion that the 1 percent default estimate is conservative because it is far lower than the 5 percent price increase that might be used in defining a market according to a SSNIP test. However, we suggest that this is *not* necessarily the case. Our reasoning is set out at the first appendix to this chapter. Instead, we would argue that the 1 percent default estimate should be seen as conservative only if the more sophisticated empirical evidence generally suggests that the mergers challenged by the authorities would lead to price rises far higher than 1 percent. We turn to the theory and practice of such empirical studies below.

Precise estimates using detailed case-specific data

- 6.10 As noted above, there may be cases where, in the course of an investigation, detailed information is unearthed which provides an immediate indication of by how much prices will rise following a merger. This is self-explanatory and

requires no further comment, except that it is likely to be infrequent! Rather more interesting is the possibility that statistical data may be available, with which to infer the likely impact, perhaps econometrically.

- 6.11 The best illustration is provided by the case of Staples/Office Depot (1997). This involved a proposed merger between two of the largest office superstore chains in the US. Since they both operated across the US, and because different cities can be thought of as independent markets, there was scope for investigating spatial price differences in terms of spatial differences in market structure. More precisely, there were sufficient numbers each of local markets in which the two firms were, and were not, in competition, for it to be feasible to estimate the effects on price of displacing duopoly with monopoly (loosely speaking). Abstracting from the statistical details of the case (both sides provided econometric evidence), two numbers give a flavour of the findings. First, prices in cities with little or no competition between the two firms were up to 15 percent higher than in cities where there was competition. Second, econometric estimation points to a 'typical' differential somewhere in the region of 9 percent. Note, however, that, in order to estimate these differentials, the econometrician needed fairly detailed data at the local level, and a sufficient number of markets where the firms were, and were not, in competition. Clearly, this may be an interesting avenue to explore in certain cases which have come before the UK competition authorities.
- 6.12 However, one might remain sceptical that there will be many cases which will turn out to be so data-rich, or in which the nature of the market is so conducive to 'natural experiments' of this type. While the Staples/Office Depot case may not be singular, it is striking just how often it is cited as an example⁸⁵. On the other hand, perhaps this view is too pessimistic. Undoubtedly, there is a growing number of cases where academics have used detailed datasets to good effect for markets like beer, breakfast cereals, cars etc; and this will increase with access to market research surveys and scanner-type data. Indeed, Baker (*ibid*, p.18) reveals that 'The FTC economic staff has conducted and reviewed econometric studies and simulations derived from regression studies in many merger investigations including Staples.'

A review of the relevant academic (industrial organisation) literature

- 6.13 The remainder of this chapter is designed to explain in detail what is meant by simulation methods. But first, to help provide the context, in this section we briefly summarise developments in the recent literature which helped

⁸⁵ Two of the standard references are Baker (1999, pp. 11-21), and Serdar and Warren-Boulton (1999).

spawn these methods. The first part describes some key papers on the equilibrium analysis of mergers, the second part provides a tour of the literature on product differentiation – the setting in which simulation is most necessary.

MERGERS

- 6.14 A convenient reference point is to start with Structure-Conduct-Performance (SCP). Broadly speaking, within this traditional paradigm, the main concern was that a merger, leading to increased concentration, would raise the chances of collusion – what we now refer to as the coordinated effects. This was enshrined in the original merger guidelines and the structural emphasis on market shares and concentration. As late as 1991, Scherer argued that merger policy should mainly focus on the potential for coordinated effects since, where they occur, these are likely to be much more important quantitatively than unilateral effects.
- 6.15 Over the last 15-20 years, however, the emphasis in the literature has switched to the unilateral effects. A unilateral effect occurs merely as a consequence of individual firms choosing to revise their price/output/product positioning etc choices as a consequence of the new market structure of the industry post-merger. It will occur even without any change in the mode of conduct, since equilibrium price(s) will typically change post-merger. End note 2 to this chapter distinguishes between unilateral and coordinated effects using a simple algebraic model.
- 6.16 The catalyst for this branch of the literature was a paper, Salant, Switzer and Reynolds (1983) which showed that under certain restrictive assumptions, mergers were typically unprofitable for the merging parties. These assumptions were (i) Cournot behaviour, (ii) homogeneous product, (iii) symmetric firms, (iv) constant marginal costs, (v) not merger to monopoly, (vi) no efficiency effects from the merger. With hindsight, it is not this headline result that was so significant – others quickly established how it could easily be overturned by modifying the assumptions⁸⁶. Rather, what was seminal was the understanding it provided on *why* the merger would be less profitable for the interested parties, in this type of model: it follows crucially from the behaviour of the non-merging firms (the outsiders). In the Cournot equilibrium, the insiders will choose to contract their output (ie the merged firms supply less post-merger than the sum of their outputs pre-merger), but the outsiders choose to increase their output. This is a key point when

⁸⁶ For example, see Perry and Porter (1985), who used alternative cost assumptions.

computing the effects on the weighted average industry marginal costs and price, since when later models allow for marginal cost to differ among firms, what becomes important is whether the merger diverts output to higher or lower cost firms.

6.17 This literature was taken forward significantly by Farrell and Shapiro (1990). Generalising, by extending the model to asymmetric firms, they established a number of important results.

- Crucially, they showed that, unless the merger leads to cost savings (and/or entry), it must result in increased price.
- Moreover, even where there are cost savings, these need to be very significant if they are to offset the forces working towards an increased price.
- However, this is not to say that aggregate welfare will necessarily fall, because the realignment of market shares following the merger may lead to a higher proportion of industry supply now in the hands of low cost firms. In turn, this leads to various predictions about welfare enhancement in terms of the market shares of both the merging and non-merging firms.
- For example, if the non-merging firms are relatively more efficient, then the reallocation of output post-merger, will lead to a lower weighted average marginal cost, and thus higher producer surplus. Given that more efficient firms have larger market shares in the Cournot model, it is more likely that aggregate welfare will increase the smaller are the market shares of the merging firms, and the more concentrated are the non-merging firms⁸⁷.

6.18 Farrell and Shapiro also investigated the nature of the cost savings (synergies) which might result from a merger, and their likely impact on price. In the following formulation of a firm's cost function:

$$c_x^i(x_i) = \theta_i \cdot \varphi(x_i, k_i) \quad (6.1)$$

6.19 θ_i is the (inverse of) knowledge of firm i , $\varphi(\cdot)$ is a short-run variable cost function and k_i measures a capital good employed by firm i . How can a merger lead to cost savings?

⁸⁷ Obviously, this is even more important to the analysis of the effects on total surplus, as opposed to just consumer savings and consumer surplus.

- i) Rationalise output across facilities, ie change x_i by shifting some output to the lower cost plant of the merged firm (keeping total output unchanged).
 - ii) Shift capital about, keeping total capital constant.
 - iii) Learn from each other, combining the θ_i s.
- 6.20 They show that the really crucial cost saving is (iii); (i) can never lead to lower prices whereas (ii) can at most do so in the short run.
- 6.21 Turning to mergers in models of **product differentiation**, the literature has tended to work within a Bertrand, rather than Cournot, framework. Deneckere and Davidson (1985) established two early important results: (i) without cost savings or entry, the merger must lead to a price increase, but (ii) in this case, the non-participants also raise their prices. The first is consistent with the above Cournot result, but the second underlines an important difference between Cournot and Bertrand models (best response functions slope downwards in the former, but upwards in the latter). In fact, most of the academic work over the last decade has focused on product differentiation, with many of the main contributors keen advocates of simulation methods.
- 6.22 To see why simulation has assumed a prominent role, consider some of the implications of a merger within a market which comprises firms selling differentiated products. One point is fairly obvious: in these circumstances data on concentration and market shares alone are now not nearly so informative. With all firms producing a homogeneous product, a change in the supply from one firm has the same effect on the price received by all others (there is only one price). But with differentiated products, some firms will supply closer substitutes than others. It follows that there may be some mergers between quite large firms which will have little effect on prices (where their products are not close substitutes), while other smaller merging firms (supplying close substitutes) may have much more effect on price. In other words, to calculate the likely effects on price, we need to know the pattern of cross-price elasticities – in principle between all products within a market. If we also want to allow for the possibility that the merger affects costs, and if we want to take into account how non-participants react to the merger (eg by repositioning their products or by new entry), the analysis becomes very complicated. Hence the need for simulation techniques.

PRODUCT DIFFERENTIATION

- 6.23 Broadly speaking, theoretical models can be grouped into three types. In one dimensional spatial models⁸⁸, competition between brands is local: each firm competes only with immediate neighbours – these are the only non-zero cross-price elasticities. On the other hand, in global models, deriving from Chamberlin’s Monopolistic Competition⁸⁹, all brands compete with each other, with identical cross-price elasticities. There are intermediate depictions, for instance, the characteristics approach, inspired by Lancaster, in which brands may compete in several dimensions. As the number of characteristics increase, so do the number of neighbours, and competition becomes less local.
- 6.24 Underlying any demand system, there is, at least implicitly, a modelling of the consumer preferences which might give rise to that system. In this respect, models differ in their assumptions about how many brands consumers can purchase – it tends to be only one in spatial models, giving rise to the so called discrete choice approach. In global models, they are allowed to buy more than one, opening up an important real-world issue – consumer preferences for variety.
- 6.25 The link between consumer preferences and the demand function is best explained in terms of the *random utility discrete choice model of consumer behaviour*, Berry (1994). In this, for consumer i , net utility from buying the particular brand j is assumed to be a linear function of the characteristics (vector X) of the brand and (negatively) its price:

$$U_{ij} = \beta_{ij}X_j - \alpha_{ij}p_j + \mu_{ij} \quad (6.2)$$

where X is a vector of the brand’s characteristics (some of which may be unobserved by the econometrician), p is price, and β , α and μ are effectively ‘taste’ parameters. The consumer selects the brand which yields him/her the highest utility. Since, in principle, the taste parameters will vary across different consumers (hence the term ‘random’ utility), so different consumers may choose different brands. The aggregate demand curve for the brand can be derived once assumptions are made about how the taste parameters are distributed across consumers. Different specific models impose restrictions on these parameters.

⁸⁸ For example, Hotelling’s linear model (1929), Salop’s (1979) circular model (both referring to horizontally differentiated products), and Gabszewicz and Thisse’s (1979) vertical model.

⁸⁹ As initially developed, for example, by Dixit and Stiglitz (1977).

Special case I: the (Multinomial) logit model⁹⁰

- 6.26 This is very much the 'base' model, which is very easy to estimate. Here, we will use a simplified version⁹¹, in which all characteristics are conflated into a single parameter, β . The key assumption in the logit is **that all consumers have the same β and α** , and that only μ can vary between them. Given these assumptions, the utility function simplifies to:

$$U_{ij} = \beta_j - \alpha p_j + \mu_{ij} \quad (6.3)$$

- 6.27 Assuming that μ_{ij} is a well-behaved random disturbance term⁹², the probability that the consumer will choose a particular brand can be derived:

$$\pi_j = \exp\{\beta_j - \alpha p_j\} / \sum_{k=1 \dots n} \exp\{\beta_k - \alpha p_k\} \quad (6.4)$$

- 6.28 An attractive feature of this simple model comes when we aggregate across all consumers. It is easy to derive a simple relationship between the market share gained by a particular brand and its price:

$$\ln(s_j) - \ln(s_0) = \beta_j - \alpha p_j + \mu_j \quad (6.5)$$

where 0 refers to the 'outside good', ie all goods not in this market.

Other (undesirable) properties

- 6.29 It is easily shown that:

Its own price elasticity is: $\xi_{ii} = -\alpha p_i (1 - s_i)$

And all cross price elasticities are: $\xi_{jk} = \alpha p_k s_k$

- 6.30 Thus, demand becomes more elastic with increases in price and the smaller is market share. There is also a sort of symmetry with respect to all other brands. For instance, if all brands are priced identically and have equal market shares, all cross-price elasticities are identical. Thus, in this model, there are no local neighbours, as in the spatial models: all brands are equal substitutes for each other (as in Chamberlin type models). It is undesirable to impose any of these properties on a demand system. Ideally, one would like to test whether or not they fit the data, rather than implicitly assuming that they do.

⁹⁰ For example, Werden and Froeb, 1994.

⁹¹ In versions of the model which explicitly distinguish the different characteristics of the brands, β is replaced by a vector of characteristics, each with its own coefficient, as in (6.2).

⁹² μ is uncorrelated with price, and is independently and identically distributed according to the extreme value distribution.

Special case II: the nested (multinomial) logit

- 6.31 This is a more general form of the logit. Here the brands are grouped into segments of 'like brands'. The indirect utility function, for a given consumer i from a given brand j from a given group g , is then extended to read:

$$U_{ij} = \beta_j - \alpha p_j + \gamma_{ig} + (1 - \alpha_g)\mu_{ij} \quad (6.6)$$

where γ_{ig} represents an (unobserved) taste parameter of consumer i which is common to all brands within the group, and σ_g represents the within-group correlation ($0 < \sigma_g < 1$). As σ_g and γ_{ig} tend to zero, this collapses to the basic logit – this means, for the consumer, there is only a very small group-specific effect and we are back to close to overall symmetry. But as σ_g and γ_{ig} become large, the consumer tends to value all brands within a given group similarly, and the only real substitutes for a given brand are other brands in the same group⁹³.

- 6.32 This leads to a revised version of (6.5), in which the market share for the individual brand now depends additionally on its share within the group to which it belongs. Likewise, the elasticities now depend also on its group share.
- 6.33 Relating this back to the localised/global spectrum, this model allows for intense competition within groups but not necessarily across groups. Nevertheless, there is still essentially homogeneity within groups⁹⁴.

Generalised random utility models

- 6.34 More generally, it is possible to allow the β to vary freely across all consumers. This then provides the flexibility in substitution (between brands) which is absent in the logit model and restricted in the nested logit.

Localised spatial models

- 6.35 There is a different strand to the empirical literature, much more obviously related to the local competition part of the theory. For instance, Bresnahan's model of vertical differentiation in the car market (1981 and 1987) has only a single parameter which reflects brand quality. Here, it follows that each brand competes directly only with its two immediate neighbours in the vertical

⁹³ Thus, large values of γ and σ indicate homogeneous groups.

⁹⁴ It is worth noting here that the analyst has discretion in choosing these groups. In this sense, it would be wrong to claim that use of this model obviates the need for judgements similar to those used in conventional market definition.

spectrum. Consumers are located at v along the 'line' $[0, V_{\max}]$; the distribution is assumed to be uniform. Denoting the quality of car by x , Y is income not spent on cars and v his marginal utility of quality. The consumer derives utility:

$$U(x, Y, v) = Y + vx \text{ if a car is purchased,} \quad (6.7)$$

- 6.36 For a particular model i of intermediate quality, we can identify the consumers who are indifferent between this brand and the next brand up or down the quality ladder ($i - 1$ and $i + 1$). This gives a demand curve for brand i which depends on its price and quality relative to the two local rivals

$$q_i = \delta \left[\frac{(P_{i+1} - P_i)}{(x_{i+1} - x_i)} - \frac{(P_i - P_{i-1})}{(x_i - x_{i-1})} \right] \quad (6.8)$$

- 6.37 The vertical quality of a brand is assumed to depend (in a very restrictive way) on its observable characteristics, and, as in simple spatial models of horizontal differentiation, the brand competes only with its immediate neighbours.
- 6.38 Feenstra and Levinsohn (1995) offer a natural extension of Bresnahan, in that they assume that utility depends on a vector of characteristics, not just a single quality measure. Since there are a number of quality dimensions. This means that brands may compete with more than just two immediate neighbours, but only so long as they share a common market boundary (ie they are neighbours in at least one of the dimensions of quality). Nevertheless, if brands do not share a boundary, they do not compete.

Multi-stage budgeting

- 6.39 In all of the above models, it is assumed that the consumer buys just one brand (if at all). Sometimes, this discrete choice model has been generalised, eg by Hausman, Leonard and Zona (1994)⁹⁵, Hausman and Leonard (1997), who allow consumers to purchase several brands. Their work, which derives from Gorman's multi-stage budgeting theory, has three levels of demand for a differentiated product:
- the top level, in which consumers decide how much to spend on the product,
 - the medium level, in which they allocate aggregate expenditure on the product into broad types/segments, and
 - the low level, in which they select specific brands within the type.

⁹⁵ See also OFT Research Paper 17 (1999, Chapter 15) which provides an introduction to this technique.

- 6.40 For example, we might wish to estimate the demand for newspapers (the broad product); the sectors might be ‘quality’ and tabloids; the brands might be ‘The Times’, ‘Daily Mirror’ etc. The data might be panel (over time and across different cities).
- 6.41 This is similar to the nested logit but non symmetry is allowed within groups. Estimation starts at **bottom level**, using an *Almost Ideal Demand System*. Within a given sector, m , estimate:

$$S_{int} = \alpha_{in} + \beta_i \log y_{nt} + \sum_{j=1 \dots J} g_{ij} \log p_{jnt} + \epsilon_{int} \quad (6.9)$$

where S is share of brand i in total expenditure on the sector at time t in city n , y is overall expenditure on that sector, p are the prices of the different brands. The estimates from this level are then used to construct price indexes (Π_{mnt}) for each of the m types for each area and time period which are used in the **medium level**:

$$\log q_{mnt} = \alpha_{nm} + \beta_m \log (Y_{nt}) + \sum_{m=1 \dots M} \delta_m \log \pi_{mnt} + \epsilon_{mnt} \quad (6.10)$$

where q is quantity demanded and Y denotes total expenditure on the product.

- 6.42 The estimates from this level are then used to construct a price index (Π) for the product as a whole, which are used in **the top level**:

$$\text{Log}G_t = \alpha_0 + \beta \log(YD_t) + \delta \log p_t + \eta Z_t + \epsilon_t \quad (6.11)$$

where G is total demand for the product, YD is real disposable income, Z is a vector of (say demographic) variables affecting the demand for the product. Once the model has been fully estimated, the full set of unconditional elasticities for each brand can be calculated⁹⁶. An example of this approach is their own work on paper tissues, in which there were two broad types (premium and economy). Own-price elasticities were estimated to be around -3 to -4 , and cross elasticities were very low (never more than $+0.7$). Moreover, the cross-elasticities were all different from each other and asymmetric.

Sensitivity

- 6.43 An interesting discussion of the sensitivity of estimates to the particular demand system used is provided by Rubinfeld (2000, p. 174) in the context of a merger in the US breakfast cereal market:

⁹⁶ Note that the δ in the bottom level are not unconditional elasticities because (a) the dependent variable is not logged, and (anyway) (ii) they are conditional on the expenditure for a given type, y_{nt} .

While the benefits of reducing the number of parameters in a demand system are appealing – to facilitate identification when instruments are few, to simplify computations, or to deal with limited data – the results can be quite sensitive to the restrictions that are made. What I did not understand well prior to Kraft was the sensitivity of estimated demand parameters to the particular specification of the demand model. It became clear during the course of Kraft that the decision to include a product or group of products in one segment rather than another can substantially affect the conclusion that one reaches concerning the definition of the relevant antitrust market.

- 6.44 Competition authorities should therefore note that ‘sophisticated’ does not necessarily mean ‘robust’. The authorities may not wish to rely on the estimates without first considering how sensitive they are to a change in the assumptions.

The simulation methodology

WHAT IS SIMULATION?

- 6.45 Typically, simulation analysis of mergers has three stages.
- **Stage 1** requires a choice of model for the oligopoly game in the market concerned. Are products homogeneous or differentiated? Do firms act unilaterally or in a coordinated (collusive) way? If products are indeed differentiated, are they symmetrically so, or is competition more localised?⁹⁷ This stage therefore requires the choice of a particular model of differentiation, eg logit versus nested logit.
 - **Stage 2** is calibration of the model’s parameters. Here, the idea is to attach specific values to the parameters in the model’s equilibrium in order to derive estimates of the unknowns. In some cases, the unknowns might be the firms’ marginal costs; in others it might be ‘conjectural variations’ parameters, or the equivalent. The specific values will sometimes be derived from direct observation (eg existing market shares and prices and, perhaps, extraneous estimates of demand elasticities). In other contexts, full-blown econometric estimation of the demand system (as above) may be necessary.

⁹⁷ Incidentally, the fact that many markets, even when supplying basically homogeneous products, have a geographically localised dimension, means that differentiation models are by no means confined to obvious cases where there are strong brands.

- **Stage 3** is simulation of the post-merger equilibrium. In other words, the equilibrium is now recomputed, using the calibrated parameters and estimated marginal costs, but now allowing up to three things to change: (i) coordination in the price-setting of the brands of the newly merged firm, (ii) any claimed synergy effects, e.g reductions in the marginal costs of the merged firm, (iii) reactions by outsiders⁹⁸.

EXAMPLES OF SIMULATION IN PRACTICE

- 6.46 In fact, it is not always clear in which cases simulation has been used by the US authorities⁹⁹. Probably the best known, and most widely cited, case is the proposed (but actually blocked) merger between Interstate Bakeries and Continental Baking (reported and discussed by Shapiro, 1995). This involved brands of bread, and copious scanning data were available. In this case, simulations suggested price increases of between 5 percent and 15 percent in the Los Angeles and Chicago areas, see Shapiro (1995). Shapiro also confirms that (simulation) is commonly used by the Antitrust Division's economists. He cites two other examples: the Gillette pens case (1993) involving potential substitution between pens, ball point pens etc, and the proposed cereals merger between Kraft and Nabisco, (see below).
- 6.47 Other examples (not all by the authorities themselves) we are aware of include:
- L'Oreal's acquisition of Maybelline (DoJ).
 - Froeb and Werden's (1994) exposition of their own simulation approach in the (hypothetical) context of long distance carriers. An interesting feature of their simulations is that, when there are market asymmetries in firm sizes, the smaller of the merging firms might increase prices by much more than the larger firm. In a logit setting, it is better to raise price more for the good with the small market share since the good with the large market share is in a better position to pick up displaced demand. Also, their results suggested that while outside firms increase prices, they might not increase them very much.
 - A merger of two HMOs in Minneapolis: Feldman (1994) uses a nested logit to estimate that prices would increase by 19 percent.

⁹⁸ In general, they will now want to change their price and in response to the price changes of the merged firms. This is covered, in principle, when the new equilibrium is computed. Rather more difficult is the possibility that they will also want to reposition their products (similarly, and where the potential for new entry becomes important).

⁹⁹ It is interesting to note the observation made by two private-sector practitioners, Mills and Weinstein (1999): 'Unfortunately, the Agencies have been reluctant to share specific methodological details and analytical results'.

- Kimberley-Clark and Scott (tissues): Hausman and Leonard (see above) estimated the merger would lead to price increases in the range of 1-2 percent.
- Propane case (Canada)¹⁰⁰: in this case, there were attempts to quantify the likely price rise of the merger of two propane gas distributors. Economic experts representing both sides used a variety of econometric techniques. Loosely speaking, the method employed by both sides was to choose an economic model which best represented the type of industry at hand. Having assumed or estimated the pre-merger elasticity of demand and the mark up on marginal cost, it was then possible to simulate the possible price increase post merger, accounting for any efficiency benefits which might lower marginal cost. The Canadian Competition Tribunal had to weigh up the econometric advice provided by both sides. This included an assessment of technical issues and more factual issues such as the extent of efficiency savings that would affect fixed as opposed to marginal costs. Under the extreme assumption that all of the claimed efficiency savings resulted would result in lower marginal costs, then simulation techniques predicted that the merger would lead to *lower* prices. However, since some of the claimed efficiencies would either not arise or would primarily affect fixed costs, the Tribunal found that the merger would lead to a price increase. The estimates of the price rise resulting from the merger accepted by the Tribunal were in the range of 8-11 percent¹⁰¹.

A specific example in more detail

6.48 To help add some flesh to the above skeleton description of the simulation approach, we now turn to a very recent example which is Nevo's (2000) study of mergers with differentiated products: the case of the US ready-to-eat cereal industry. This can be thought of as describing current best practice, which is of sufficient interest to the academic community to merit publication in probably the world's leading journal (RAND) for this sort of study.

6.49 The study covers the period 1988-1996. The industry is highly concentrated, with the top 3 firms, Kellogg, General Mills and Post, accounting for about three quarters of the market, which comprises about 200 brands. All leading firms are, of course, multi-brand, and this, in itself, has led to antitrust concerns over a number of years. During this period, there were a number of significant

¹⁰⁰ The Commissioner of Competition v Superior Propane Inc., 2000, Comp. Trib. 15.

¹⁰¹ The case is particularly interesting on a point of law since the Canadian Competition Tribunal seemed to accept the 'efficiency defence'. It argued that efficiency gains did not have to prevent or neutralize any estimated deadweight loss or reduction in consumer surplus since this would be, in effect, to rule out the efficiencies defence. Instead, efficiency gains had to 'compensate' for any reduction in competition.

mergers, notably Kraft's (the owners of Post) acquisition of Nabisco's cereal lines in 1992. Amongst other things, the purpose of Nevo's article is to evaluate the effects of this merger.

- 6.50 To estimate the demand system, scanner data are used. The database covers 24 different brands, in 45 cities, over 20 quarterly periods (1988-1992). In terms of the variance of price, inter-brand differences account for the largest proportion (revealing a wide range of brands included), and the variance across cities is rather greater than that across time¹⁰².
- 6.51 Relating his model to the above description, he employs a random utility discrete choice model of consumer behaviour. The utility a consumer is assumed to derive from consuming a particular brand is determined by a set of characteristics of breakfast cereals (such as calories, sodium and fibre content), net of the price of the brand. The consumer chooses the brand which offers the maximum indirect utility. While the actual characteristics offered by any particular brand are identical for all consumers, the liking of consumers for those characteristics will differ between consumers¹⁰³. Of course, preferences for characteristics by individual consumers are not observable, so assumptions are required for the general way in which they will vary across consumers. This aggregational assumption is also essential for estimation since the data refer to aggregate not individual demands. The unobserved components are modelled by assuming that they may vary between brands and over time (captured by time and brand dummy variables in a panel).
- 6.52 This leads to a demand model in which the explanatory variables include the characteristics mentioned above, dummy variables representing the broad segment of the market in which the brand lies ('All-family', 'kids', 'adult'), and brand and time-dummy variables. The econometric model also provides estimates of the extent of variability across consumers in tastes and importance attached to price. In effect, this model amounts to a generalized and flexible nested logit. As always with models of this type, there are econometric issues of identification and simultaneous bias. While we need not explore these in any detail here, it is essential in these circumstances to have access to sensible instrumental variables. In this case, he exploits the independence of markets in geographical space to good effect (p.405).

¹⁰² This property of the data turns out to be important when selecting appropriate instrumental variables.

¹⁰³ Incidentally, this a model allows for both horizontal and vertical differentiation – horizontal because consumers attach different weights to the characteristics, and vertical because the coefficient on price can also vary across consumers (so, for instance, richer consumers will be less deterred by a high price for high quality brands).

- 6.53 Of course, estimation of demand equations are not the ultimate purpose, they are required as an input into the simulation of the effects of mergers. To complete the analysis, he therefore needs a model of the oligopoly game. He assumes a Bertrand equilibrium, and from the first order conditions implied, this generates, for each brand, a relationship between the price cost margin and market share (p.403). This relationship involves demand elasticities, which have now been estimated in the demand system. Therefore, by substituting these into the first order condition, it is possible to estimate the (unknown) marginal costs of each brand.
- 6.54 Armed now with estimates of marginal costs on the one hand and the parameters of the demand system on the other hand, he then turns to simulating the hypothetical post-merger equilibrium. In every respect but one, this will be identical to the pre-merger situation. The difference is, of course, that the prices of the brands now under the single ownership of the newly merged firm are now set, not in competition with each other, but so as to maximize the joint profits generated by those brands. In turn, outsider firms will also want to change their prices.
- 6.55 The model generates estimates of the own-price and cross-price elasticities of brands on the demand side, and simulated prices of the brands on the supply side. Most own-price elasticities are in the range -1.5 to -2.2 (although Corn Flakes and Frosties are more own-price elastic). Cross-price elasticities vary considerably in the range 0 to 0.5.
- 6.56 The simulated price increases following the Kraft (Post) acquisition of Nabisco are 3.1 percent for Nabisco's Shredded Wheat and 1.5 percent for Post's Grape Nuts. These estimates are based on various assumptions about the post-merger equilibrium: (i) no change in costs, (ii) no change in the nature of the oligopoly game (ie no coordinated effects), (iii) no change in marketing strategies (eg product repositioning and/or increases in advertising).

A back of the envelope equivalent

- 6.57 The advocates of simulation often stress the increased accessibility of these techniques, given the speed of present computing technology, and considerable developments have indeed been made, conceptually as well as logistically. We believe that there is certainly the scope for introducing the approach into UK policy practice. Nevertheless, they are both data and time intensive, calling for high technical competence in economic and econometric modelling. Since results are also typically highly sensitive to assumptions, it would be wrong to imagine that the typical investigation might start with a short sharp bout of simulation, yielding unambiguous results. The norm, we suspect, would be organic development of modelling over a number of months.

6.58 Thus, Nevo (ibid, p. 396) explains:

The analysis was performed without time pressure and using (almost) ideal premerger data. Time and data constraints might limit the ability to perform this analysis in real time.

As such, there may be a case for developing 'back of the envelope' versions of simulation, which might be applied in the early days of an investigation. These might help give a feel for the sorts of magnitudes involved, even if they could not be used formally in any report in the public domain. Closer to home, ie the immediate purpose of this project, perhaps 'backs of the envelope' might offer the chance of generating quick estimates of likely price effects from a range of previous merger cases.

6.59 In this spirit, arguably the most valuable contribution, for present purposes is included in Shapiro's address to the American Bar Association (1995)¹⁰⁴. Having described the very detailed work which was possible in the Interstate Bakeries/Continental Baking Co. case (where copious scanner data were available), he goes on to explain: 'The reality is that data are rarely available to do this type of full-blown simulation analysis with assurance...(but there are still)... some rough and ready quantitative procedures that can be used when hard data are scarce.' These can be explained in terms of the following 4 step procedure (where A and B are two merging brands):

- **Step 1:** Try to measure what fraction of the sales which would be lost by Brand A if its price was raised would be captured by Brand B. Call this the diversion ratio¹⁰⁵. Preferred methods (in descending order) are econometric estimation of elasticities; consumer survey data; and company or other documents concerning consumers' first and second brand choices. If all else fails, market shares might be helpful.
- **Step 2:** Use the estimated diversion ratio, along with pre-merger margins to give a rough prediction of post-merger prices – absent cost savings or rival response.
- **Step 3:** Try to anticipate product repositioning and entry. Here, the history of brand entry, exit and repositioning might be helpful.
- **Step 4:** Allow for any genuine cost savings likely to ensue, but only conceding those which are truly merger-specific and marginal cost reducing.

¹⁰⁴ This is the voice of a leading academic who has had the job of translating sophisticated theory and econometrics into practical guidelines for practitioners.

¹⁰⁵ Formally, this is the ratio of the cross-price elasticity between the two brands to the own-price elasticity.

- 6.61 Not much can be said, in general, about Steps 3 and 4 as they will be very case-specific. But on steps 1 and 2, he offers the following 'back of envelope' first-blush approach.
- 6.62 Assuming that the elasticity of demand is constant, the firms are single-brand and the two are symmetric pre-merger, it can be shown (see Endnote 3 to this chapter) that the profit-maximising proportionate price increase resulting from the merger is:

$$(p^* - p)/p = mD/(1 - m - D) \quad (6.12)$$

where p^* and p are post- and pre-merger prices respectively, M is (as above) pre-merger mark-up, and D is the diversion ratio.

- 6.63 The intuition behind this result is that the effective elasticity faced by each brand post-merger has decreased because, now, the prices of A and B are coordinated to remove competition between the two brands. Where D is low, the brands are not seen as alternatives by consumers, and the effect is negligible; but where D is high, a significant amount of switching is avoided by raising the two prices in tandem. For example, suppose the pre-merger mark-up is 40 percent, and the diversion ratio is 0.2, it will be optimal for the firm to raise price by 20 percent (this is because the elasticity the firm has changed from 2.5 to 2).
- 6.64 If one is prepared to make draconian assumptions about the nature of differentiation, there is a simple way of linking the diversion ratio to market shares. In particular, suppose (i) that the dominant reason why firms face downward sloping demand for their brands is competition between brands (ie when the price of a brand is raised, nearly all the lost custom is because consumers switch to other brands, rather than leaving the market altogether), and (ii) that all brands within a given market or sub-market are equally close or distant substitutes for each other. In these special circumstances, one can approximate the diversion ratio from A to B by the proportion of demand for non A brands accounted for by B. Thus, if A has a market share of 50 percent and B 25 percent, $D = 0.5$. Obviously, this will underestimate diversion to the extent that A and B are closer than average substitutes, while overestimating it to the extent that they are weaker than average substitutes and/or some consumers would leave the market entirely following a rise in price of their favourite brand.

Two illustrations

- 6.65 As an illustration of how this works out, consider first the Post acquisition of Nabisco (as described by Nevo). At the time of the merger, the firms' market shares were in the regions of 11 percent and 3 percent respectively, thus, Post accounted for $11/97 = 11.3$ percent of the non-Nabisco share of the market, and Nabisco accounted for $3/89 = 3.4$ percent of the non-Post share of the market. Nevo does not report the actual margins for either firms or brands. However, he does impute and report marginal costs, from which we can derive estimated pre-merger price cost margins for Shredded Wheat and Grape Nuts (the two brands which were, apparently, the closest substitutes). Depending on the exact form of the model estimated, these are either 0.219 or 0.392 for Shredded Wheat and either 0.258 or 0.438 for Grape Nuts.
- 6.66 Substituting the lower estimates into Shapiro's formula, for Shredded Wheat, $D = 0.113$ and $m = 0.219$, and the predicted price increase would be 3.7 percent. For Post, $D = 0.034$ and $m = 0.258$, and the predicted price increase would be 1.2 percent.
- 6.67 Even although the implicit assumptions of Shapiro's 'back of the envelope' are clearly violated in this particular case, these estimates are remarkably close to Nevo's own estimates from his much more sophisticated model, namely 3.1 percent and 1.5 percent respectively¹⁰⁶.
- 6.68 A second illustration is, however, less encouraging. This comes from Hausman and Leonard's paper (1997), applying their multi-stage budgeting model to the Kimberley-Clark and Scott merger in paper tissues. They predict rather low post-merger price increases, including 2.4 percent for Kleenex. According to LECG (OFT, 1999), when what we call the Shapiro formula is applied to the data in this case, it predicts a much larger increase of 12.7 percent. They conclude
- the use of diversion analysis to simulate price increases resulting from mergers can lead to very biased results when the products in the market are not perceived by consumers as equally substitutable (p.101).
- 6.69 This large discrepancy is attributable to the estimated cross price elasticities being much lower under the AIDS approach than the those implied by the diversion ratio analysis. This is probably the classic example of problems with the implicit logit assumption. Because the logit imposes an assumption that all goods are equally differentiated – equally 'distant' from each other, the

¹⁰⁶ On the other hand, using Nevo's higher estimates, the Shapiro formula generates much higher simulated price increases: 9 percent and 2.8 percent respectively.

formula can be very misleading if A and B are not close substitutes. If the latter then, even if B has a large market share, there may be little incentive to increase price post merger. AIDS is more flexible and so is better placed to allow cross elasticities to differ.

6.70 Of course, this interpretation is based on the premise that Hausman and Leonard's model provides the 'true' estimates, and this itself is debatable. Nevertheless, the example does illustrate the potential danger in applying the formula without any regard for the nature of the brands concerned.

Conclusions

6.71 Much of the material covered in this chapter is to provide the background to our own work on UK mergers in the next chapter. To avoid repetition we will not attempt a lengthy summary.

6.72 In a nutshell, US practice can be summarised briefly as follows.

- In (probably not many) special cases, sufficient detailed information is available at the time of investigation to impute the likely outcome of the merger statistically, without delving too deeply into economic theory, and without making too many assumptions. For example, in the Staples/Office Depot case, it was possible to impute the likely effect of a switch from duopoly to monopoly by observing price in those local markets which were already monopolised pre-merger. In other words, the 'real world' already contains an appropriate comparator.
- In rather more cases, no natural comparator exists. Nevertheless, rich data sets may be available, and these allow the authorities to simulate the possible effects of the merger. In these cases, analysts draw explicitly on modern oligopoly theory (often including models of product differentiation) to recover estimates of unknowns (eg marginal costs). However, the judgemental element is high: how to model differentiation, what assumptions to make about the nature of marginal costs, the nature of the oligopoly game etc. Because of this judgemental element, there is considerable scope for disagreement¹⁰⁷.
- Whether or not the data are sufficient to support complex simulation, at the outset of an investigation it would be possible to undertake a 'back of the envelope' simulation which is easy to compute, requires little detailed information, and helps set the ball-park.

¹⁰⁷ However, the disagreement does not often centre around the nature of the oligopoly game – unilateral effects appears to be the 'norm'.

- If all else fails, the authorities estimate a lower bound on consumer savings from a successful merger challenge as 1 percent of the turnover of the merging parties in the relevant market. Judged against most estimates where more sophisticated methods are subsequently applied, this seems to be a very conservative lower bound. Likewise, the assumption that the savings will last no more than 2 years (FTC) or 1 year (DoJ) is probably conservative. The one year assumption certainly implies that the market is able to react remarkably quickly to the emergence of monopoly power (see paragraphs 2.33-2.34).
- 1 percent lower bound is not obviously derived from the application of a SSNIP test to theoretical models of mergers. We conclude that while the 1 percent default estimate is somewhat arbitrary, it nevertheless serves as a useful lower bound and is likely to err comfortably on the safe side.

Endnote 1 to Chapter 6: How does the 1 percent default estimate relate to the SSNIP test?

Both the FTC and the DoJ have a default measure for consumer saving (1 percent of the volume of commerce affected) which is used when more sophisticated methods are not available. The quote from FTC's plan (1997-2002) seems to suggest that the default estimate is linked to the SSNIP test used to define the relevant market. We interpret the line of reasoning as follows:

- (i) Given that the FTC has challenged a merger, it has judged that prices could increase by at least 5 percent before a significant number of consumers would turn to outside substitutes, and that entry by other firms to deter anti-competitive pricing is unlikely to occur for at least two years.
- (ii) This presumably refers to a 5 percent price rise by *all* incumbents
- (iii) The implication is that, if it is a merger to monopoly, or one which facilitates full collusion, the incumbents would indeed find it profitable to raise price by at least 5 percent – compared to the price which currently obtains¹⁰⁸.
- (iv) This is not necessarily to say that it expects that the merger would lead to a full increase of at least 5 percent. This would only occur if the merger were to monopolise – either by literally replacing the existing market structure by monopoly, or by changing the mode of conduct to full collusion. More generally, the merger might lead to a *more cooperative*, but still not completely collusive equilibrium, or it might be that the unilateral effect would take the market closer to, but not reach, the full monopoly price.
- (v) Therefore, it is necessary to err on the side of conservatism, by assuming a price increase which, typically, falls some way short of 5 percent. 1 percent is such a number!¹⁰⁹

This appears to be a 'back of the envelope' type approach, and it may be that we have missed a more sophisticated justification somewhere in the literature.

¹⁰⁸ We shall duck any discussion of the Cellophane fallacy here. While our purpose is to *deduce* the FTC's line of reasoning, there is little to be gained here from *questioning* it at length.

¹⁰⁹ Officials at FTC and DoJ are, of course, well aware of the limitations of the default estimate. However, refining it, as we hope to show, is no mean task.

¹¹⁰ Willig appears to have been one of the architects of the revised 1992 guidelines.

¹¹¹ He notes the possibility that the process of market delineation might not yield a set of products over which a hypothetical monopolist would find it profitable to raise price by only 5 percent. Where there are 'gaps' at the edge of the market, the inclusion of the marginal firm into the market definition might lead to a situation where the hypothetical monopolist would find it profitable to raise price by t percent, where $t > .05$. In that case, (6.1.2) becomes: $e = \{(1+t)/t\} - H.\beta/t$; for instance, if $t = 0.1$, $e = 11 - 10 H.\beta$. The absolute value of e is inversely related to t .

However, one can detect its roots in Willig¹¹⁰ (1991). In a passage where he attempts to 'validate the guidelines approach to merger analysis' (p.288), he notes that many simple theories of oligopoly have had their equilibria characterised by the following expression:

$$M = \beta.H/e \tag{6.1.1}$$

where M is the (industry) price-cost margin, e is the market elasticity of demand (defined as a positive number), H is the Herfindahl index of concentration and β is a parameter that represents the mode of conduct. For example, under Cournot competition, $\beta = 1$, with price taking $\beta = 0$, and more generally β can be interpreted as a conjectural variation term (see also Clarke and Davies, 1982).

He suggests that a 'market delineation can now be represented as the choice of universe over which to measure concentration such that the monopoly price (which generates a mark-up of $1/e$) is 5 percent greater than the current price', which is represented in equation (1). Simple algebra shows how this calibration can yield the following expression for e in the relevant market:

$$e = 21 - 20 H.\beta \tag{6.1.2}^{111}$$

Willig goes on to show how this can be used to predict the change in price (and total welfare) following the merger. He shows that the change in price will depend on (a) the change in concentration and (b) any change in the mode of conduct (corresponding respectively to unilateral and coordinated effects). Both are consistent with the emphasis in the guidelines on the structural approach (remembering the general presumption that collusion is more likely where concentration is high and rising because of the merger).

In correspondence, Parisi (from the FTC) also refers to Willig's article and the following formula for estimating the proportionate change in prices:

$$dP/P = dH/(e - H_1) \tag{6.1.3}$$

(1 and 0 subscripts denote post- and pre-merger, and d refers to change).

This is a standard result for how much price will rise given a change in concentration in a Cournot equilibrium¹¹², and it can be easily derived from (6.1.1) where $\beta = 1$. It does not follow from, or use, the SSNIP test, but could easily be

¹¹² We should stress that this depends on a variety of assumptions, for instance, the product should be homogeneous, the demand elasticity must be constant, and costs unchanged – indeed, technically, it also requires symmetry of costs.

¹¹³ For the sake of simplicity, this is a slight approximation: strictly speaking the parameter is 0.99/0.21, not 5.

combined with (6.1.2); for example, under Cournot (with $\beta = 1$):

$$dP/P = dH/(21 - 21H_0 - dH) \quad (6.1.4)$$

The attraction of this expression is that we can estimate the likely price change purely in terms of the level of concentration its post-merger change (both of which are highlighted in the guidelines, section 1.5). Note that, by using the results of the SSNIP test, we have been able to substitute out for the (sometimes unobservable) demand elasticity.

Hypothetical example

To see how this might work out in practice, consider a market which is concentrated, ex-ante, say $H_0 = 0.33$, and in which the merger would lead to a significant further increase, by say 0.17 to 0.5. According to (6.1.4), the proportionate increase in price would be 1.2 percent.

More generally, (6.1.4) can be rearranged to show that price will increase by at least 1 percent so long as:

$$1 - H_0 < 5dH \quad (6.1.5)^{13}$$

In fact, the range of mergers which would satisfy this condition is remarkably limited. To see this, consider the case of a symmetric industry (in which all firms are of the same size). In these circumstances, it is easily shown that the H index simplifies to the reciprocal of firm numbers. If there are N firms pre-merger, reducing to N - 1 post merger, (6.1.5) can be rewritten, after simple manipulation, as:

$$(N - 1)^2 < 5 \quad (6.1.6)$$

and this is only satisfied if $N < 4$.

In other words, only mergers in markets involving no more than 3 firms ex-ante will lead to a price increase of more than 1 percent!

As it happens, this counterintuitive result is not surprising, given the famous result of Salant et al (1983), that mergers under these restrictive assumptions are rarely privately profitable. The reason is that in the post-merger equilibrium, the non-merging firms (the 'outsiders') increase their own output, which considerably dampens the price rising effect of the exit of the acquired firm. (This is the consequence of, amongst other things, the assumption of constant marginal costs).

But it is also inevitable that price rises will be typically small, given the implication of the whole exercise: starting from a Cournot equilibrium, even a monopoly to merger would only lead to a 5 percent increase in price. This effectively implies a very elastic demand curve (eg even with a symmetric duopoly, ie $H=0.5$, $\beta=1$ equation (6.1.2) requires that the elasticity is 11). As it happens, condition (6.1.5) becomes less restrictive if we relax either the assumption of Cournot behaviour, or if we allow for more than a 5 percent increase in price following a hypothetical merger to monopoly¹¹⁴. However, the former would imply coordinated effects, while the latter would discard the SSNIP criterion.

In short, it is difficult to see how a 1 percent can be interpreted as a conservative estimate which derives from the SSNIP test. Of course, the above analysis is based on a specific restrictive model and, perhaps, there is an alternative justification of which we are unaware. On the other hand, an alternative (more realistic) conclusion is that the 5 percent figure in the test is really only meant to be illustrative number to indicate that products in the same market must be 'close' substitutes as opposed to a number that must precisely apply to every market delineation¹¹⁵.

To put it more provocatively, given the restrictive assumptions set out above, it is unlikely that there will be many mergers which will lead to a price increase of at least 1 percent, if even a monopoly would raise price by no more than 5 percent. Therefore, while the 1 percent figure may nevertheless be a conservative measure, this is not an unambiguous result which is ground out of theory. We need empirical data to guide us as addressed in the rest of this chapter.

¹¹⁴ For example, a 10 percent price increase and $b = 2$ would change (6.2) to read $e = 11 - 0H$.

¹¹⁵ After all, to assess formally whether a SSNIP would be profitable would require information on own and cross price elasticities of demand and information on costs. As noted below, such data are rarely available. Furthermore, we might argue that, armed with this information, we could proceed directly to simulation of the effects of the merger – making the SSNIP test itself redundant. This is not to suggest that market definition is not useful; quite clearly, market definition is important as a frame of reference to scope the issue under investigation. We are simply making the point that a formal SSNIP test is rarely feasible in practice.

Endnote 2 to Chapter 6: Unilateral versus coordinated effects in a simple model

To formalise the distinction between a merger which has purely unilateral effects from one which has coordinated effects, consider a purely hypothetical example of a symmetric triopoly, in which three firms each sell a differentiated brand of the product in question.

For simplicity, assume the demand system is symmetric – demand for each brand depends in linear way (positively and identically) on prices of competing brands and (negatively and identically) on the brand's own price.

Each firm has constant marginal costs of 0.67. We ignore entry, exit and product repositioning.

$$Q_a = 1 - P_a + P_b/6 + P_c/6$$

$$Q_b = 1 + P_a/6 - P_b + P_c/6$$

$$Q_c = 1 + P_a/6 + P_b/6 - P_c$$

Q and P refer respectively to quantity and price, and subscripts a,b,c refer to each of the brands of the three firms.

Pre-merger equilibrium

Prior to merger, each firm sets price independently of the others to maximise its own profits in a one-shot game. This yields a price-setting Nash equilibrium with the following outcomes¹¹⁶:

- Price of all three brands = 1.
- The market is shared equally between the three brands.
- At this price, each brand has an own price elasticity of -3, and all cross-price elasticities are +0.5.

¹¹⁶ Algebraically, this equilibrium is calculated by maximising each firm's profits with respect to its own price, holding rivals' prices constant. This yields a best response function for each firm, which shows the optimal price for the firm, corresponding to the prices of its two rivals. Since there is a best response function for each firm, the equilibrium reflects the solution to a system of three simultaneous equations.

Post-merger equilibrium: unilateral effects

Suppose A and B merge to form (A/B), which is now in Bertrand competition with just one outsider, C. Firms A/B and C are still assumed to maximise their own profits given the price of their rival. However, the crucial difference is that the prices of A and B are now set cooperatively, taking into account (internalising) the cross-effects of the price of A(B) on the demand for B(A)¹¹⁷. The new equilibrium prices are:

$$P_a = P_b = 1.0339, \quad P_c = 1.00565$$

Prices of the merged brands have risen by 3.4 percent, and the outsider uses the opportunity to raise its own price a little, by 0.56 percent.

Post-merger equilibrium: coordinated effects

Alternatively, suppose that, in the post-merger world, tacit collusion now replaces Bertrand competition¹¹⁸. In that case, firm A/B and firm C now set their prices up to the joint maximising levels. At the limit, this is as if there is a single firm, selling three brands and setting prices to internalise all cross-effects. The equilibrium now becomes¹¹⁹:

$$P_a = P_b = P_c = 1.0833$$

Comment

In this example, both unilateral and coordinated effects are quite large – probably sufficient to justify antitrust intervention. However, the actual numerical values are arbitrary. Higher cross-price elasticities, for example, would ensure greater effects. Moreover, the difference between unilateral and coordinated effects could become more pronounced once we allow for asymmetries in the cross price elasticities. Note, however, that, quite generally:

¹¹⁷ Algebraically, this equilibrium is calculated by maximising firm A/B's profits with respect to both P_a and P_b , holding P_c constant, and maximising C's profits with respect to P_c , holding P_a and P_b constant. The new equilibrium reflects the solution to the revised system of three simultaneous equations.

¹¹⁸ For example, suppose that the game is a repeated game, in which the parameters are such that, while tacit collusion is not the equilibrium when there are three players, it is the equilibrium with only two players.

¹¹⁹ Algebraically, this equilibrium is calculated by maximising joint profits with respect to each of the three prices and solving the resulting three simultaneous equations.

- there can not be unilateral and coordinated effects simultaneously – it is one or the other¹²⁰,
 - the price of the outsider will always rise (absent cost savings) in a model of Bertrand price competition with differentiated products, and
 - all three prices will rise by more with coordinated effects than with unilateral effects.
-

¹²⁰ It might be argued that if tacit collusion breaks down for some reason, a possibility is that there could be a punishment phase where all firms resort to the non-cooperative price. If so, then since the non-cooperative price is higher as a result of the merger then a merger can lead to both unilateral and coordinated effects. However, here we note that either one or the other applies – not both at the same time.

Endnote 3 to Chapter 6: Deriving 'Shapiro's formula'

A profit maximising firm facing its own demand curve, which has an elasticity of e , will set a price-cost margin, m , given by

$$m = (p - mc)/p = 1/e \quad (6.3.1)$$

Consider the reasons why demand for the brand declines if the firm raises price: some consumers leave the market altogether, but some (most?) will switch to other brands, assuming that there are close substitutes. Now consider the demand relationship between two brands, A and B which are produced by two firms which are about to be merged. Suppose that, when the price of A is raised, a fraction, D , of the lost demand is diverted to brand B. It follows that, once the firms merge, and A and B are priced in a parallel way, this part of the market for A will no longer be lost as the price of A is raised. So instead of demand falling by e percent following a price rise for A, post-merger, it will only fall by $e(1 - D)$ percent.

Thus, assuming no change in costs, the post-merger margin is given by:

$$m^* = (p^* - mc)/p^* = 1/(1 - D)e \quad (6.3.2)$$

Combining (A1) and (A2), substituting out for mc , and rearranging, gives:

$$(p^* - p)/p = D/\{e(1 - D) - 1\} \quad (6.3.3)$$

and substituting $1/m$ for e and rearranging gives:

$$(p^* - p)/p = Dm/\{1 - D - m\} \quad (6.3.4)$$

7 QUANTIFYING PRICE RISES IN UK HORIZONTAL MERGER CASES

Introduction

- 7.1 This chapter now turns to the possibilities for quantifying possible price rises in UK merger cases which have been investigated by the OFT or the Competition Commission (CC, formerly the Monopolies and Mergers Commission, MMC). The chapter is in two broad parts, reflecting our two objectives:
- i) to explore the scope for applying some of the methodologies discussed in the previous chapter to particular UK cases, and
 - ii) to assess the feasibility of quantifying the aggregate 'consumer savings' resulting from all cases of UK merger intervention in a given year.
- 7.2 As a first step in these directions, we have assembled a sample of six merger cases on which the MMC reported between 1997 and 1999. The next section introduces the sample. From this sample, two cases have been selected for further analysis: both involve mergers between majors in highly concentrated markets with only three or four significant players. One is a homogeneous product, flour, and the other is a differentiated product, beer. We produce estimates of the likely price rises in the third and fourth sections. We then discuss the other four cases more briefly, drawing out some key features on which more information and analysis might be fruitful. We also venture some informed guesses on the likely price rises.
- 7.3 In the light of these six cases, we turn more explicitly in the second part of the chapter to the second above objective. Here, we assess how much more information we would need in order to provide a broad estimate of the consumer savings resulting from merger investigations in a typical year. Finally, we summarise our views on the feasibility and desirability of such an exercise.

The sample of cases

- 7.4 The original intention was to survey horizontal mergers considered by the MMC between 1997 and 1999. Having reviewed an initial pilot of six cases in detail, it became apparent that to continue would be informative but time consuming. Therefore we decided to postpone further reviews to a later stage of the project. In any case, our six cases provided scope to carry out sufficient simple simulation to clearly indicate some of the (difficult) issues which would be involved in arriving at aggregate estimates of consumer savings in merger cases.

TABLE 7.1 – THE SAMPLE CASES

<i>Date</i>	<i>Cm</i>	<i>Case</i>	<i>Market share</i>		<i>Product</i>	<i>Nature of product</i>
			<i>Acquiring</i>	<i>Acquired</i>		
June 97	3662	Bass-Carlsberg/Tetley	23	14	Beer	Differentiated
Dec 97	3773	NEG-Scotrail	8	55	Public transport	Differentiated
April 98	3925	Fresenius-Caremark	up to 11	Up to 76	Contracted homecare services	Differentiated
Sept 98	4030	Ladbroke-Coral	26	12	Off course betting	Homogeneous
Sept 98	4031	Tomkins-Kerry	17	21	Flour for free market	Homogeneous
Dec 99	4544	UFC-Pointings	50	24	Synthetic food colouring	Homogeneous

Simulating the price effects (i) for a homogeneous product

7.5 As an example of the sort of analysis which might be conducted for an industry producing a largely homogenous product, we have selected the proposed Tomkins-Kerry merger (1998) in the flour industry.

CHARACTERISING THE CASE

7.6 From the details given in the appendix to this chapter, the following stylisation seems reasonable.

- **The product:** flour sold in the free (untied) market, assumed to be largely homogenous.
- **Pre-merger market structure:** the market was dominated by three roughly equal-sized firms, with combined market share of about 60 percent. The remainder was accounted for by one firm with 7 percent, and 21 other regional firms with a combined share of 35 percent.
- **The merging firms:** two of the majors, Rank Hovis (RH) with a market share of 17.4 percent and Spillers Milling (SM), with a share of 21.2 percent. These were subsidiaries of Tomkins and the Kerry Group, respectively.
- **Costs:** the MMC suggests that scale economies were not important. However, in the short-run, capacity is limited by the number and size of mills. At the time, spare capacity was typically of the order of 10 percent. The MMC judged there to be no merger-specific efficiency gains.

- **Nature of pre-merger conduct:** there were some suspicions of price leadership and/or tacit collusion, but no hard reasons for rejecting non-cooperative behaviour.

MODELLING THE EQUILIBRIUM

7.7 Assume that the market demand curve for flour is given by:

$$P = \alpha - \beta X \quad (7.1)$$

where P and X are price and industry output respectively.

7.8 Suppose that marginal costs are constant, but different across firms; so, for firm i :

$$MC_i = c_i \quad (7.2)$$

7.9 Allowing also for fixed costs, gross profits for firm i are:

$$\pi_i = P.X_i - C_i X_i - F_i \quad (7.3)$$

7.10 The first order condition for a maximum is:

$$\delta\pi_i/\delta X_i = P + (dP/dX_i).X_i - c_i = 0 \quad (7.4)$$

7.11 To derive the non-cooperative equilibrium, we will make the Cournot assumption. Employing the zero conjecture, and inserting the slope of the demand curve from (i), (iv) can then be rewritten as:

$$P - \beta X_i - c_i = 0 \quad (7.5)$$

7.12 Summing across all N firms in the industry:

$$NP - \beta X - \sum c_i = 0,$$

ie

$$P_0.(N + 1) - \alpha - \sum c_i = 0 \quad (7.6)$$

EFFECT OF THE MERGER

7.13 From (vi), **pre-merger price** is given by:

$$P_0.(N + 1) - \alpha - \sum c_i = 0 \quad (7.7)$$

- 7.14 After the merger, firm numbers fall to $N - 1$, and the industry sum of marginal costs falls by the MC of the 'exiting' firm (denoted by c_x). Thus **post-merger price** is given by:

$$P_1 \cdot N - \alpha - (\sum c_i - c_x) = 0 \quad (7.8)$$

- 7.15 Subtracting (vii) from (viii), and re-arranging, the proportionate change in price is:

$$(P_1 - P_0)/P_0 = \{(P_0 - c_x)/P_0\}/N \quad (7.9)$$

- 7.16 In this case, $N = 25$ and SM's gross profits to revenue ratio (which we use to proxy the price-cost margin) was 34.2 percent¹²¹. Thus

$$(P_1 - P_0)/P_0 = (1/25) \cdot (0.342) = 1.368 \text{ percent} \quad (7.10)$$

DISCUSSION AND NECESSARY EXTENSIONS

- 7.17 The prediction of a price increase is unsurprising, given the Farrell-Shapiro result (described in the previous chapter, 1990) that any merger must increase price in a Cournot equilibrium, absent any efficiency changes. We should stress, however, that the above calculation is merely illustrative. We have chosen a method which has very undemanding data requirements. Needless to say, more extensive experimentation would be advisable, including sensitivity analysis on some of the simplistic assumptions used. A deeper analysis would require further work, at the least, on the nature of: (a) the demand curve, (b) the oligopoly game, (c) the cost function. We now discuss each of these briefly.

(i) an alternative demand function

- 7.18 Suppose, instead of (7.1), the demand function is linear in logs, with a constant elasticity of e . Then (7.4) would be rewritten as:

$$P - P/e \cdot (X_i/X) - c_i = 0 \quad (7.5)'$$

and summing across all firms:

$$P(N - 1/e) - \sum c_i = 0 \quad (7.6)'$$

¹²¹ For illustrative purposes the gross profits to revenue ratio is suitable as a proxy for the price cost margin. However, we note that, depending on how gross profit is calculated, it may under or overestimate the price cost margin.

7.19 Pre-merger and post-merger prices are

$$P_0 \cdot (N - 1/e) - \Sigma c_i = 0 \quad (7.7)'$$

$$P_1(N - 1-(1/e)) - \Sigma c_i + c_x = 0 \quad (7.8)'$$

and the proportionate change in price is

$$\{(P_1 - P_0)/P_0\} = \{(P_0 - c_x)/P_0\}/\{(N - 1 - (1/e))\} \quad (7.9)'$$

7.20 Note that, in this case, the denominator of the right hand side of (7.9)' will be slightly smaller than that of (7.9). It also requires an estimate of the demand elasticity (e). There are a number of ways of obtaining a value for e. One possibility would be to identify an estimate from the existing literature. Alternatively, one might use some of the observables in the present case, and appeal to the first order conditions. For example, we might use the first order condition for the exiting firm. Equation (7.5)' can easily be rearranged to yield a familiar Cournot result – the firm's margin equals its market share divided by the market elasticity. For the exiting firm (SM), we know that its margin is 34.2 percent and its market share is 21.2 percent. This implies that $e = .212/.342 = 0.62$. Inserting value into (7.9)' yields a predicted post-merger price rise:

$$\{(P_1 - P_0)/P_0\} = 0.342/22.4 = 1.525 \text{ percent}$$

7.21 As can be seen, this is slightly higher than the estimate from the linear demand curve model, but the order of magnitude is qualitatively similar. Superficially at least, this suggests that results might not be very sensitive, in this particular case, to the precise assumptions made about demand.

(ii) Further thoughts on costs

7.22 In our opinion, the same is unlikely to be true for costs. Arguably, it is this aspect of the model for which further work would be most essential. While any deeper treatment would require more information and space than is possible here, we can easily illustrate why cost assumptions are likely to prove crucial. First, recall, from the previous chapter, the well known limitation of the constant costs Cournot model (Salant et al): mergers are rarely profitable. So far, we have assumed that all firms have constant (if different) MC. The consequence of a merger is that one firm exits the market, and no surviving firm's costs are affected in any way. Thus, all firms 'benefit equally' from the exit of a competitor– whether or not they are a party to the merger. In Cournot equilibrium, the surviving partner in the merger increases its output beyond the pre-merger level, but not by as much as the output 'lost' by the exit of the

other partner. Equally, all other firms (the 'outsiders' to the merger) also increase their outputs. It is as if the merger creates a positive externality for the outsiders, as well as for the acquiring firm.

- 7.23 This can be illustrated here by considering the linear demand model. From the first order condition (7.5), it is easily shown that each surviving firm increases its output, post merger, by the same amount, ie:

$$(P_1 - P_0)/\beta \tag{7.11}$$

- 7.24 Since we know, from (7.9), that

$$P_1 - P_0 = (P_0 - c_x)/N \tag{7.12}$$

and, from the first order condition for the exiting firm, that

$$(P_0 - c_x) = \beta X_x \tag{7.13}$$

it follows that, in this model, all $N - 1$ surviving firms will increase their output by X_x/N (where the subscript x refers to the exiting firm).

- 7.25 In this respect, the acquiring firm is no different from any other firm. Indeed, the expansion by outsiders compensates for nearly all of the output lost by the exit. In this case with $N = 25$, each outsider would expand its output by an amount equivalent to almost 1 percent (ie 23/25 percent) of pre-merger market size. Notice that, even for the fourth largest firm, Heygates, this would be equivalent to a 10 percent increase in its pre-merger output, and for many of the remaining 21 smaller firms, it would amount to a doubling of size.
- 7.26 This unlikely outcome is a direct consequence of the assumption that all firms can increase output without any increase in marginal cost. In reality, however, we know that, in this case, capacity is strictly limited by mill size; as already mentioned, spare capacity at this time was running at about 10 percent. In other words, there is no real possibility that post-merger expansion by outsiders could be as much as implied by the above post-merger equilibrium. Although, by the same token, this would imply that it would be optimal for RH to increase its output by more than the above, it is likely that the aggregate post-merger reduction in aggregate industry output (and the increase in price) would be significantly greater than implied by the above hypothetical post-merger equilibrium.
- 7.27 In modelling terms, the costs side of our story might be enriched in a number of ways. In terms of the standard literature, there is an obvious candidate – Perry and Porter's model (1985), in which marginal costs are assumed to be

rising in output, but inversely related to the firm's share of aggregate industry capacity (which might be proxied in this case by the number of mills). Reworking the post-merger equilibrium with these revised assumptions would imply that more of the positive effects of the exiting firm are internalised by the acquiring firm, since outsiders would find it optimal to increase their output by less. The expectation would be that the post-merger price increase could be much higher than 1.5 percent. With the data at our disposal this far past the event, it is doubtful whether we could calibrate the cost side of such a modified model with any degree of accuracy; and, anyway, this would have little more than academic interest. On the other hand, such modelling should be entirely feasible – and, in our opinion, worthwhile – if conducted at the time of the investigation.

(iii) Alternative equilibria to Cournot

- 7.28 There are at least two reasons why the simple Cournot equilibrium may understate the post-merger price increase. First, we have assumed that all 25 millers play Cournot. However, as explained, nearly all of these firms are very small regional players. An alternative modelling strategy would be to assume that these firms can be described as a competitive fringe, accepting the price set by the three majors. Even if we assume a Cournot game amongst the 3, or perhaps 4 majors, this might lead to a far larger post-merger price increase¹²².
- 7.29 Second, we have abstracted from the possibility of a coordinated effect from the merger. However, a merger such as this, reducing the number of major players from 3 to 2 in a homogeneous product market, would surely raise doubts on this front¹²³. This might be modelled by introducing a conjectural variations model (which would probably be difficult to calibrate). Without formal modelling, we can not be precise, however, it is probable that the post-merger price increase would be considerably higher than 1.5 percent if the merger would lead to a switch from a non-cooperative to a partially cooperative equilibrium.

Simulating the price effects (ii) for a differentiated product

- 7.30 To illustrate some of the issues likely to feature in a typical case involving product differentiation we have selected the proposed Bass/Carlsberg-Tetley merger (1997). A reading of the report suggests that the following stylisation seems reasonable.

¹²² Returning to equation (x), note that the price increase with $N = 4$ rises dramatically to 8.5 percent, although this might be dampened by the existence of the fringe, with some scope for expansion post-merger.

¹²³ Interestingly, coordinated effects seems to have been given greater prominence in the past few years in the EC under the ECMR.

CHARACTERISING THE CASE

- **Nature of product:** Beer is a differentiated product, in the sense that there is a large number of brands, differentiated from each other. There are three broad types of beer: lager, ale and stout, the first two of which can be broken down into sub-types; for example, premium lager is sometimes distinguished from standard lager.
- **Pre-merger market structure:** the market was dominated by four majors (market shares in brackets): Scottish-Courage (28 percent); Bass (23 percent); Carlsberg-Tetley (14 percent); Whitbread (13 percent). The remainder was accounted for by Guinness (the dominant firm in stout), 65 regional breweries and about 200 micro breweries.
- **The merging firms:** Bass and Carlsberg-Tetley (CT), were thus ranked 2 and 3, and their combined market shares, if maintained post-merger, would make them the number one firm in an asymmetric triopoly – albeit with a sizeable ‘fringe’.
- **Cost savings:** there may have been some scope for merger-specific cost savings. As usual, for brewery mergers, there were expectations of brewery closures and claimed savings in distribution and wholesaling costs by removing duplication of facilities. In fact, there is no ex-post evidence that there would have been any merger-specific efficiencies. Although the merger did not take place, the breweries closed anyway, and there has been little reduction in distribution and sales forces (Slade 2001).
- **Vertical ties:** although the earlier ‘Beer Orders’ had made significant inroads into the traditional vertical integration (between manufacturing and retailing), vertical ties were still apparent at the time of this proposed merger. Another issue was that distribution would become more concentrated, raising the fear that the merged firm would raise distribution costs for rivals. Nevertheless, we shall not consider any vertical issues here.
- **Coordinated behaviour?** It is debatable whether there was coordinated behaviour pre-merger, and, like the MMC, we shall assume that the two firms behaved non-cooperatively, in spite of an element of cross-ownership, even before the merger¹²⁴. Whether the post-merger shares (two firms with over half the market) would have been conducive to collective dominance is open, but we shall not assume this here.

¹²⁴ Slade (2001) could not reject the hypothesis of Bertrand behaviour in her econometric simulations.

- **Competing brands:** all majors are, of course, multi-brand, with brands in each of the broad types of beer (Tables 2 and 3). The merging firms accounted for 11 of the 30 best-selling brands, and these 11 brands alone accounted for about one quarter of the market in volume terms. Casual empiricism suggests that the merging firms had a number of directly competing brands. For example, within the lagers, Carling and Tennents (for Bass), and Carlsberg, Castlemaine and Skol (for CT) appear to be top-selling fairly close substitutes. Within ales, Worthington and Caffreys (Bass) and Tetley and Stones (CT) might be close substitutes. Geographically, the two firms originated from the north or north-midlands, and, their geographical spreads at the time of the merger appear to have been broadly similar

MODELLING THE EQUILIBRIUM

- 7.31 For the sake of simplicity, we shall abstract from (i) coordinated effects, (ii) line forcing and other vertical issues, (iii) efficiency effects. Loosely speaking, the first two might lead to higher price raising effects; the third might ameliorate price rises, but, as already mentioned, there are not strong reasons for expecting merger-specific efficiency gains. On balance, to the extent that these assumptions are invalid, they would tend to underestimate the price rising effects of the merger.
- 7.32 Clearly, the remaining central issue is how to model product differentiation most appropriately. Certainly, there is a strong horizontal dimension, and we would argue that vertical differentiation is also apparent: this is the strong implication of the commonly drawn distinction (by the industry itself) between premium and standard beers. This would suggest that a simple logit approach would be inappropriate, in that there are the discernible segments mentioned already. We would not want to employ a model which implies symmetry (in substitutability) across all brands. Perhaps a nested logit, recognising these broad segments, would suffice, but even this might be inappropriate given asymmetries in geographical coverage. For present purposes, we shall explore two different approaches – one simplistic in the extreme, the other ‘sophisticated’ in the extreme.

(i) Shapiro’s rule of thumb

- 7.33 First, we return to the ‘back of envelope’ approach of Shapiro, as described in the previous chapter. According to this, the predicted post-merger price increase will be:

$$mD/(1 - m - D)$$

where m is the pre-merger margin of the acquiring firm and D is the diversion ratio.

7.34 Here, we will treat Bass as the acquiring firm. Bass Brewers Ltd's pre-tax profits as a proportion of turnover, in 1996, were 8.8 percent (MMC, p. 43), thus we assume $m = 0.088$. In order to estimate the diversion ratio, we shall assume that CT's brands are no more or less close substitutes for Bass brands than are those of all other brewers. As such, since Bass had an aggregate market share of 23 percent, and CT, 14 percent, we estimate D to be $0.14/0.77 = 0.182$ (CT's share of the non-Bass market pre-merger). Thus, the predicted price increase of the brands of the merging firms is:

$$0.088 * 0.182 / (1 - 0.088 - 0.182) = 2.194 \text{ percent}$$

7.35 We have already stressed in the previous chapter that this formula only applies strictly, given a series of (unlikely) assumptions. These include:

- CT's brands are no more or less close substitutes for Bass brands than are those of all other brewers (consistent with the logit model),
- constant elasticities,
- if the price of one brand rises, consumers are inclined to switch brand rather than quit the beer market altogether (implying a very low aggregate price elasticity for beer as a whole),
- symmetry ex-ante between Bass's and CT's brands (indeed, strictly, the formula requires single brand firms), and
- no brand repositioning.

(ii) A more serious simulation

7.36 Clearly, the Shapiro formula is, at best, a first blush guess approximation¹²⁵, and certainly no substitute for a more thorough analysis (although, as discussed below, on balance in this case we might *a priori* expect the estimate to be biased downwards). At this point, we should acknowledge a rare stroke of luck (for us as researchers). After deciding to include this as one of our example cases, we became aware of some excellent current econometric

¹²⁵ So as not to cast aspersions on Shapiro's own considerable technical sophistication as an economist, we should stress again that Shapiro himself never suggests that the formula is anything more than this.

research by Slade, together with Pinkse (2001), on the UK brewing industry. This serves perfectly as an illustration of what might be done with sufficient data by an experienced practitioner.

- 7.37 One purpose of their paper is to simulate the effects of various mergers (actual and aborted) on brand competition and pricing in UK brewing. Fortuitously, this includes the Bass/CT merger. Their general approach is typical of research of this type (see our earlier discussion of Nevo in Chapter 6): they estimate a demand system, model the mode of competition pre-merger, and then simulate prices pre- and post-merger, assuming no change in the mode of competition, except (of course) that the prices of the brands of the merged firms are set cooperatively post-merger. The novelty of their paper is in the precise econometric model of demand used, which employs what they call distance functions. Here, we shall confine our summary to brief descriptions of (i) the type of data employed, (ii) the modelling of product differentiation, (iii) their results.

Data

- 7.38 Their main source (Nielsen) provides information on 63 brands, observed over two bimonthly time periods (in 1995) for two regions (London and East Anglia), and two types of pub (independents and chains). For each brand, they know the price, sales volume and coverage (percentage of outlets stocking the brand). They have also collected information on the alcoholic content, product type and brewer identity for each brand. The model also requires information on marginal costs, which they based on information reported in MMC 1989, updated for inflation.

Model of differentiation

- 7.39 Unlike most models of this type, the consumer is assumed here to potentially buy a number of brands (rather than just one, as in discrete choice models). So, starting with a standard indirect utility function for the individual consumer (which depends on the prices of all brands), they derive individual and market demands for brand i , in which demand depends on the prices of all brands and income. Since there is a demand function for each brand, there are too many own price and cross-price elasticities to estimate separately. This is where they introduce their own novel approach, with a structure which involves making the own-price demand elasticities depend on the brand's own characteristics (and to vary over time and between regions), and making the cross-price elasticities depend on how different are the characteristics of the different brands – the *distance measures*. The demand system is estimated econometrically using instruments (basically, the price of a brand in region j is used as an instrument for its price in region k).

7.40 The attraction of this approach is that it does not *impose*, ex-ante, a particular structure on the nature of differentiation between brands. Rather, the *estimation* reveals what is appropriate. In this particular case, 'the final parametric demand equation (turns out to be) similar to a nested multinomial logit, where the nests are product types. In addition to the product groupings, however, we find that beers with similar alcohol contents compete, regardless of type.' (ibid, p. 24) In other words, the closest substitutes for Carling Black Label (a standard lager) are other brands of standard lagers (including Carlsberg), but some ales etc. with similar alcohol contents are also fairly close substitutes¹²⁶. When this demand model is combined with a model of non-cooperative Bertrand pricing¹²⁷, it is possible to simulate the pre- and post-merger vectors of brand prices.

Results

- 7.41 The 'headline' result (for our purposes) is that the simulation of the merger suggests that it would lead to an 'overall price increase of 3 percent. To us, this number seems substantial' (ibid, p. 28).
- 7.42 Interestingly, this is somewhat larger than our Shapiro estimate above (2.2 percent). Indeed, the real difference is even larger than this as the Shapiro estimate refers to only the prices of the brands sold by the merging parties. One would expect that outsiders' prices would also rise (given that best response functions are upward sloping¹²⁸), but not by so much. Therefore, the implication of the Shapiro estimate is that the overall (weighted average across all brewers) price increase would probably be less than 2.2 percent.
- 7.43 So what might account for the difference? Of course, there is no reason why the two methods – one using state of the art theory and econometrics, and one the back of an envelope – should provide similar estimates. Nevertheless, it is natural to look for any obvious systematic reasons as to why they might differ. Perhaps the answer lies with the implicit logit model underlying the back of the envelope. In this particular case, there are reasons for supposing that Bass and CT brands are relatively closer substitutes than are the random pair of beer brands. Certainly, both firms are very strong in the leading, rather than non-leading, brands. It is precisely this range of beers which will most frequently be sold alongside each other in the typical bar or pub (especially

¹²⁶ These are the number 1 and 4 best selling standard lagers, sold respectively by Bass and CT. (see Table 2(i)).

¹²⁷ The authors are also able to *test* this equilibrium-solution: they cannot reject the hypothesis that on average the market-conduct parameters are zero. They conclude 'A static Nash equilibrium in price (ie Bertrand) is therefore not an unreasonable assumption for this market.' (ibid, p. 26).

¹²⁸ See Deneckere R and Davidson C, (1985).

when untied). Moreover, both firms seem to be particularly strong in lagers. Table 2(ii) and the last bullet point in the previous sub-section underline the relatively close fits of the two firms' brand portfolios.

- 7.44 On the other hand, one reason why the Shapiro formula might generally *over-estimate* the price increase is that it ignores the possibility that brand price rises might lead to significant exit of consumers from the beer market as a whole. In this case, however, some of Pinkse and Slade's findings suggests that this effect might not be pronounced for beer. While they report typical own-price brand elasticities as high as -4.5 , the total market price elasticity is only -0.5 . This implies considerable potential turbulence in brand shares in response to differential brand price increases, but very little leakage from the market as a whole.
- 7.45 Taking the two estimates together, this case study suggests that price increases in the region of 3 percent might not be unreasonable. It also suggests that the Shapiro formula hits the right ball-park, albeit with a downward bias because of the implicit assumption of symmetry. In this case, *qualitative* analysis allows us to predict the direction (although not the magnitude) of the bias, demonstrating the importance of weighing the whole range of available evidence and not relying solely on the results of the simulation. Needless to say, it would be highly desirable to test the Shapiro rule of thumb against further cases.

TABLE 7.2 – THE 30 LEADING BEER BRANDS IN 1995/6

<i>Brand</i>	<i>Share</i>	<i>Distributor</i>	<i>Brand type</i>
Carling Black Label	6.8	Bass	Lager
Foster's	5.0	SC	Lager
Guinness	4.2	Guinness	Stout
Heineken	3.7	W	Lager
John Smith's	3.4	SC	Bitter
Carlsberg	3.1	CT	Lager
Tetley Bitter	2.6	CT	Bitter
Stella Artois	2.3	W	Premium Lager
Worthington	2.1	Bass	Bitter
Tennent's Lager	2.1	Bass	Lager
McEwan's Lager	1.9	SC	Lager
Castlemaine	1.8	CT	Lager
Stones	1.7	Bass	Bitter
Boddington	1.5	W	Bitter
Budweiser	1.4	SC	Premium Lager
Kronenbourg	1.3	SC	Premium Lager
Caffrey's	1.1	Bass	Bitter
Carlsberg Export	1.0	CT	Premium Lager
Becks	0.9	SC	Premium Lager
Skol	0.9	CT	Lager
Labatt's	0.8	W	Lager
Miller Pilsner	0.8	SC	Lager
Harp	0.8	Guinness	Lager
Webster Yorkshire	0.8	SC	Bitter
Theakstone's	0.8	SC	Bitter
Holsten	0.8	SC	Premium Lager
Tennent's Pilsner	0.7	Bass	Lager
Hofmeister	0.7	SC	Lager
Banks	0.7	Other	Bitter
McEwan's Export	0.7	SC	Bitter

Source: MMC tables 4.10 and 4.12

TABLE 7.3 – MARKET SHARES OF NON-LEADING BRANDS BY FIRM

(i) market shares of aggregate beer

	<i>Bass</i>		<i>C-T</i>		<i>S-C</i>		<i>Whitbread</i>		<i>Total</i>	
Lager										
Leading brands	3	9.6	4	6.8	8	12.8	3	6.8	19	36.8
Others	3.9		1.2		3.2		0.2		18.7	
Ale & stout										
leading brands	3	4.9	1	2.6	4	5.7	1	1.5	11	18.6
others	4.6		3.4		6.3		4.5		25.9	
All beer										
leading brands	6	14.5	5	9.4	12	18.5	4	8.3	30	56.4
others	8.5		4.6		9.5		4.7		43.6	

(ii) market shares of sub-market by beer type, percent

	<i>Bass</i>	<i>C-T</i>	<i>S-C</i>	<i>Whitbread</i>	<i>Others</i>	<i>Total</i>
Lager						
leading brands	26	18	35	18	3	100
others	21	5	17	2	55	100
Ale & stout						
leading brands	26	14	31	8	21	100
others	18	13	24	17	30	100
All beer						
leading brands	26	17	33	15	9	100
others	19	11	22	11	37	100

Source: authors' calculations from various tables in MMC

The other cases

7.46 We now consider the other four sample cases more briefly.

7.47 **The Ladbroke-Coral case (1998)** involved off-course betting, through licensed betting offices (LBOs) and over the telephone. This would appear to be either a largely homogenous product, or one which is horizontally differentiated merely by the geographical locations of the betting shops. If the former, then one might use similar modelling techniques to those described for flour; if the latter, then a Hotelling type geographical model would be more appropriate.

- 7.48 The top three players and their market shares in LBOs and telephone betting respectively, were Ladroke (26 percent, 26 percent); Coral (12 percent, 10 percent); and William Hill (22 percent, 36 percent). In the case of LBOs, for which the top three account for 60 percent of the market, price is transparent and the product homogeneous, there would be a real possibility of coordinated effects following a merger between two of the top three. Indeed, this possibility was raised by MMC in an earlier report on the same market. The MMC also drew attention, in the recent report, to one of Ladbroke's strategy documents which stated: 'the market decline [as a result of sales lost to the National Lottery]... has seen intense competition replaced by *co-operation* which has helped raise product margins...'¹²⁹
- 7.49 An issue which would need to be resolved in any simulations is the role of the small independent bookmakers who accounted for the other 40 percent of the market. To the extent that they are a price-taking fringe, it would not be difficult to incorporate them into a Cournot type model of competition between the majors. In order to quantify the likely price increase, we would need to know only the pre-merger margin of Coral Betting Business and the elasticity of supply of the fringe. A proxy for the former is 6-7 percent.¹³⁰ In the case of licensed betting offices, the elasticity of supply of the fringe would be constrained by the need to open new betting shops. The MMC noted that the licensing system was a barrier to expansion, particularly because incumbent firms in the same area could object to the granting of a license if the new shop would attract custom from their own premises. Since there appear to be only three majors and the fringe might be 'capacity' constrained, the estimated price increase could be higher than in the flour case. For LBOs, applying equation (ix) where $N = 2$ and $m = 0.065$ suggests a price rise of 3.25 percent. Note, this would be an understatement to the extent that co-ordinated effects are not accounted for and an overstatement to the extent that the fringe would increase output. Any estimate of the price rise or of consumer savings from blocking the merger would have to be adjusted downwards to account for the MMC's finding that there was scope for price competition on only some 10 percent of LBO turnover. (This was because competition through the setting of odds was constrained by the preference of punters for betting at prices determined on course).
- 7.50 **The UFC-Pointings (1999)** case in synthetic food colouring had no adverse finding. In spite of the high market shares of the parties, who were the largest suppliers in the UK with shares of 50 percent and 24 percent respectively, the

¹²⁹ Paragraph 2.112, emphasis added.

¹³⁰ This is the average for the ratio of gross profit to revenue for Stanley 1994-97, page 70. Stanley was the largest independent with 6 percent of the LBO market.

MMC judged that entry barriers were low, and that this would act as sufficient deterrent to future price rises. We mention this merger to demonstrate how the price rise estimates are only as good as their underlying assumptions. If we apply equation (ix) above, using the gross profits to revenue ratio (for Pointings this is 26.9 percent¹³¹) as a proxy for the price-cost margin and noting that there were only five firms in the market per-merger, the estimated price rise from the merger is 6.725 percent. [$N = 4$, $m = 0.269$, $m/N = 6.725$ percent] Thus a naïve simulation, without regard to other qualitative analyses, would suggest that the merger be blocked. However, this calculation implicitly assumes no scope for new market entry. In the MMC's view, however, new entry would protect competition after the merger.¹³² As noted in the beer example above, this demonstrates the importance of weighing the whole range of available evidence and not relying solely on the results of the simulation.

- 7.51 **The NEG-Scotrail (1997)** case involved a merger in Scotland between a bus and a rail operator. Defining the product market as public transport services on routes over 50km in Scotland, the market shares were 55 percent (Scotrail) and 8 percent (NEG). The MMC's particular concern was on those routes where NEG's Citylink services overlapped with Scotrail, and where consumers' ability to switch to other operators would be limited or non-existent. This case clearly involves differentiated forms of transport, and it is likely that the existing literature will include estimates of the cross-price elasticities between rail and coach. As such, a relatively small research effort and literature search might be sufficient to provide a reasonable estimate of the price effects of this merger.
- 7.52 **The Fresenius-Caremark (1998)** case involved a merger of two firms, Fresenius and Caremark, which were contracted by the NHS to provide services to patients suffering from serious medical conditions but who needed to be treated at home. On the demand side the products were not substitutes since patients required treatment specific to their condition. For one treatment Caremark's market share was 76 percent and Fresenius' was 8 percent. However, for another treatment Fresenius was not part of the market at all, but could have entered very easily. In other words, the merger would have removed a potential, rather than an actual, competitor.
- 7.53 Here, a homogenous good methodology might be appropriate if each treatment is so distinct as to be modelled *separately* as a single market. For the first treatment, where the merged firm's market share increases to 84 percent

¹³¹ Average for 1995-1999.

¹³² This is not to suggest that the MMC was wrong – it is not the general purpose of this research project to question MMC conclusions. Indeed, the underlying principle of this research is to accept an MMC judgement as a correct reading of the case. In a similar way, we felt able to ignore efficiency savings in the flour case because they did not feature significantly in the MMC's judgement.

of the market, we might apply the flour methodology. For the other market we might assume that entry would have taken place and then work back. For example, we might assume that Fresenius would have entered a market dominated by Caremark and in so doing increased the number of firms in the market from 2 to 3. In this case, we would simulate the hypothetical post entry market, and then compare the post entry price with the pre entry price. The difference here is that instead of leading to higher prices, the merger prevents prices from falling.

The scope for providing an aggregate estimate of consumer savings

- 7.54 The conclusion to be drawn from the discussion thus far is that most individual cases lend themselves to further detailed case analysis. Given advances in recent years in the theoretical understanding and econometric study of mergers, there is already an existing library of literature, from which one will often be able to select a particular model which can be applied in a particular real world case. If true, this conclusion might suggest that such analysis might form part of any initial assessment of new cases coming before the OFT and the CC. Such assessment might also help guide any data collection undertaken as part of the subsequent investigation. Of course, we re-emphasise the points made earlier that qualitative evidence and expert judgement remain an important part of the assessment and can never be dispensed with.
- 7.55 However, it is not the purpose of this particular research project to undertake such detailed case-by-case analysis of a large number of individual cases – fascinating though such a programme might be! So we now return to the more aggregate second question posed at the start of this chapter. Supposing that one is required to provide an aggregate estimate of the likely consumer savings accruing from the totality of OFT/CC merger interventions in a particular year, how helpful are estimates such as those derived above, and what additional information would we need to be collected?

SUMMARY OF METHODS USED TO CALCULATE THE LIKELY PRICE INCREASE FROM INDIVIDUAL HORIZONTAL MERGERS¹³³

- 7.56 Drawing on the discussion in this and the previous chapters, we have identified three approaches.

¹³³ We should mention again here that our interest, throughout this report, has been with horizontal mergers. A method for dealing with vertical mergers – which would probably be similar to dealing with vertical restraints – would be addressed under stage 2 of the project.

- 7.57 **Sophisticated Simulation.** Data and *time* permitting, sophisticated simulation carried out by an expert practitioner would provide an estimate of the price rise from a merger. However, unless such estimates were made at the time of the assessment, it is unlikely that the OFT would wish to use sophisticated simulation purely to help establish a consumer savings estimate. On the other hand, to the extent that such simulations are externally available (for example, we have referred above to Pinkse and Slade's work on specific mergers in brewing), these might prove to have a very useful supporting role, in confirming just how conservative are our own 'lower bound' estimates.
- 7.58 **Simple Oligopoly Models and Rules of Thumb.** As discussed above, assumptions can be made about the form of competition (eg homogenous or differentiated goods) such that simple formulae such as (7.9), (7.9)' or Shapiro's rule of thumb can be used with limited data requirements to provide a consumer saving estimate¹³⁴. The analyst will also have to judge what biases arise from using these formulae¹³⁵.
- 7.59 The crudest estimates can usually be computed with data on market shares, price cost margins, elasticities of demand, number of firms and turnover in the market. While elasticity of demand is not always essential to arriving at a crude estimate, one might nevertheless check whether other assumptions made to derive the consumer saving estimate are consistent with a reasonable elasticity of demand¹³⁶.
- 7.60 Ideally any estimates would be made at the time of the investigation – indeed, where analysts are confident that they understand the assumptions and any biases in the simulation method, estimates of the price rise would form part of the analysis itself. This is primarily for practical reasons. The analyst will have the data readily available, and the case will still be fresh in the memory so that any necessary adjustments to the crude estimates can be made. We might envisage devising a form for the analyst to complete when the data are

¹³⁴ Stage 2 of the project would allow us to analyse the scope for refining these formulae further.

¹³⁵ For example, the analyst may consider the following questions. Should the price rise be adjusted downwards to take into account a likely increase in output by the fringe or new entrants, or to account for efficiencies which lower marginal costs (given that the merger is the only way to generate these efficiency gains)? Would we expect there to be coordinated effects, or do the merging firms produce neighbouring products which might suggest that rules of thumb underestimate price rises?

¹³⁶ For example, with a differentiated product, the firm's price cost margin will be the inverse of the absolute value of the firm's own price elasticity of demand.

¹³⁷ The DoJ's experience is informative. In 1998 the Antitrust Division started to record estimates for 'consumer saving'. The exercise began in 1998. For the first two years, analysts were asked to look back over the year and derive consumer saving estimates. However this was time consuming and increased margins for error where details were not readily available. The system was changed so that as part of the documentation in any successful challenge, analysts make a consumer savings calculation at the time of the case (or at least provide the necessary information to do the calculation).

recorded, assumptions stated and consumer estimates computed¹³⁷. In general, analysts would be required to use the most conservative assumptions when arriving at their estimates, ie those which bias price estimates downwards. Of course, referrals are analysed in depth at the Competition Commission and so this would require their co-operation¹³⁸.

- 7.61 So far as the current project is concerned, we believe that it should be possible to extend this methodology beyond the cases already described in the first part of the chapter. This would obviously require some time, but might be manageable if confined, say, to covering all MMC reports in 1997 and 1998¹³⁹.
- 7.62 **Default 'Lower Bound' Measure.** The default measure would simply assume that consumer surplus would have been reduced by at least 1 percent of the relevant turnover in a market where successful action has been taken against an anti-competitive merger¹⁴⁰. Successful action could be defined as: blocking a merger outright, obtaining undertakings in lieu of a reference; or where a merger has been abandoned due to the prospect of a reference (eg because confidential guidance has been given that the merger would likely be referred). This should be straightforward for all cases once we have identified the appropriate turnover figure.

IDENTIFYING THE RELEVANT TURNOVER AND TIME PERIOD

- 7.63 Armed with our estimate of the likely price rise, the issues of turnover and time period would then have to be addressed. First, what is the appropriate turnover to which we should apply our estimate of the percentage price increase? For example, if price is estimated to rise by 1 percent, should we assume that this will apply to the turnover in the *whole* of the relevant market, or merely to the combined turnover of the *merging firms* in the relevant market?
- 7.64 With differentiated products, the Shapiro formula (for example) simulates the price rise for the merging firms only. Therefore, if our estimate of consumer savings is based only on their turnover, there will be two offsetting approximations. On the one hand, theory tells us that outside firms will also increase their

¹³⁸ Again, stage 2 might include a draft version of our suggestions for such a form.

¹³⁹ In these two years, there were 20 reports. Of those we have not already covered (see Table 1), there were seven with adverse findings and three laid aside.

¹⁴⁰ As explained in Chapter 2, a 1 percent increase in prices is only consistent with a 1 percent increase in consumer surplus if demand is perfectly inelastic (see paragraphs 2.3 – 2.17: the 'simple arithmetic answer' (SAA) and consumer surplus). Recall that for a merger that increases prices, the relationship between consumer surplus and the SAA is as follows: $CS = SAA\{1 - (e/2).(dp/p)\}$. In other words, the expression $(e/2).(dp/p)$ tells us by what percentage consumer surplus is less than the SAA. Suppose we make a reasonable assumption that e is unlikely to exceed 6, this means, that at the extreme, the SAA overestimates consumer surplus by 3 percent. Strictly speaking therefore, our default assumption, if applied to consumer surplus, is equivalent to a conservative estimate of the price rise from an anti-competitive merger of a little over 1 percent, e.g. 1.03 percent.

prices, and failure to acknowledge this would tend to bias the consumer saving estimate downwards. On the other hand, in practice, the post-merger turnover of the merged firm is likely to be calculated as the sum of the two firms' pre-merger turnovers, and we might expect the turnover of the merged firm to be less than this. This would tend to bias our estimate upwards.

- 7.65 With homogenous goods, we might argue that there is only one price and so we should take turnover of the whole market. However, in some cases, this could lead to marked differences in consumer savings estimates depending upon whether the industry is characterised as homogenous or differentiated. Therefore, a conservative approach might suggest that, in general, the consumer saving estimates should be applied only to the turnover of the merging firms.
- 7.66 At the very least, we suggest that the OFT should systematically record the turnover in the relevant market and the turnover of the merged firms in that market¹⁴¹.
- 7.67 Second, we need to address the time period over which the consumer savings are expected to last. Following the more conservative of the two US authorities, we might adopt the one year convention (see paragraph 6.9). *This should not be thought of as a 'typical' duration.* Such an interpretation would imply a belief that the market itself is remarkably swift in responding to the emergence of market power – only 12 months after a merger has occurred, new entry and/or repositioning has emerged to restore the market to its pre-merger state of competition! Rather, the 12 months assumption would be adopted in the spirit of the most conservative possible interpretation of the decision to block a merger. It seems reasonable to assume that if analysts believed that price rises would occur post merger, but that they would last, at most, for a year because new entry/product repositioning were almost certain, then (absent any other effects which would harm consumers) the merger would likely be cleared in the first place.

HOW TO DEFINE THE POPULATION OF CASES IN A GIVEN YEAR

- 7.68 In principle then, it should be possible to assign a figure to the consumer savings achieved in any particular case. In order to gross this up to an estimate of the aggregate savings achieved in a given year, we would also need a judgement on how many (and which) cases to include. This is not the simple question it might seem. The 'population' might be defined to include three types of case.

¹⁴¹ While turnover is sometimes recorded on the mergers database, this is not routinely the case. Furthermore, the figures recorded are not always the turnover of the firm in the relevant market (they often refer either to the aggregate UK or the worldwide turnover of the firm).

7.69 **The ‘tip of the iceberg’ is all cases referred to the CC.** Table 7.4 gives a feel for the magnitudes involved. Over the last 12 years, in the typical year, there has been about 10-11 merger references to the Commission. Of these, adverse effects were identified in 5-6 cases, and 1-2 were laid aside because the merger was abandoned.

TABLE 7.4 – MERGER REFERENCES TO THE COMPETITION COMMISSION (MMC)

<i>Time period</i>	<i>No. of references</i>	<i>Adverse effects</i>	<i>Laid aside</i>	<i>No adverse effects</i>
11.1.89-13.03.01	127	51 percent	15 percent	34 percent
14.3.96-13.03.01	52	60 percent	15 percent	25 percent

Source: <http://www.competition-commission.gov.uk/inquiries/mergerref89-now.htm> searched on 18 April 2001.

7.70 **Guidance cases.** In addition, the OFT records the number of occasions on which guidance is provided, either informally or as ‘confidential guidance’. If guidance is given that a merger would be likely referred to the Competition Commission with the result that the merger proposal is then abandoned, we might also record these cases as ones where consumer savings have been generated¹⁴². For confidential guidance cases, estimates of turnover and market shares in the relevant market are usually available (although these are often first blush estimates). Unfortunately, the informal guidance cases (eg where preliminary OFT views on a proposed merger are sought at a meeting, but no further views are sought) tend not to have such detailed information. However, in future, when recording that informal guidance has been given, it might be possible for analysts also to give a first blush estimate of the combined turnover of the firms in the relevant market so that a default measure for consumer savings could be made. (This would attempt to capture those consumer savings which arise without the need for a detailed and costly investigation by the Competition Commission). In principle, then, lower bound consumer saving estimates (eg 1 percent of the combined turnover of the firms in the relevant market) could be made for each guidance case where the outcome is that a referral is likely. We would need to discount these estimates somewhat to account for the fact that for between a quarter and a third of merger references to the Competition Commission no adverse effects are found.

¹⁴² However, while the number of confidential/informal guidance cases is recorded by, we understand that it is not systematically recorded whether advice was given that a reference would have been likely.

7.71 **The deterrent effect.** Arguably, the pursuit of specific merger cases by the CC (and the OFT) has an additional, potentially very important if intangible, deterrent effect. In turn, this has two dimensions. First, referrals are a constant manifestation *per se* of overall merger policy – a necessary operational adjunct of the legislation. Second, specific cases may generate their own deterrent effects for other specific potential cases which share some common characteristics (eg in the same or closely related markets, or with similar market structures). In Endnote 2 to the chapter we report some reflections on this question. On balance, however, we do not feel that this should be included in any aggregate consumer savings exercise.

Conclusions

7.72 We believe that it would be possible to calculate a plausible *lower bound* for the consumer savings arising from that part of competition policy which prevents anti-competitive mergers. For the UK, this would be based largely on methods 2) and 3) set out at paragraphs 7.58 – 7.62. The methods themselves are designed to be conservative (ie to err on the side of underestimating consumer savings). The estimates would not include estimates of any losses in consumer welfare arising from: lower quality or other non-price factors valued by consumers; longer term issues such as the impact (where relevant) of a merger on innovation; a deterrent effect. This lower bound could probably be estimated for each of the last few years without too much data collection.

7.73 Unfortunately, beyond a lower bound, we are not so confident. The only claim we would make with confidence is that the ‘actual’ or ‘true’ benefit would exceed this lower bound. We certainly do not believe that it would be prudent to produce an estimate of the aggregate ‘true’ benefit for any year, although it should be possible to indicate, in some individual cases, whether we believe that the lower bound might be particularly conservative.

7.74 Although this conclusion may be disappointing, we believe it is the correct one, bearing in mind the following:

- the (largely unavoidable) limitations of data and time mean that our methodology might be capable of providing consumer saving estimates for each case which, while conservative, are nevertheless relatively crude,
- even where these estimates are reasonable, the absolute amount of consumer savings measured would be largely driven by the turnover of the merging firms or the relevant market(s) in which they operate, and

- our methodology does not provide an estimate of the deterrent effect, although admittedly our preliminary view is that this may not be that significant for mergers in the UK (see Endnote 2 to this chapter).

- 7.75 These points have the following implications. Consumer savings are measured with error. Fluctuations in consumer saving estimates^E on an annual or even quinquennial basis are far more likely to reflect changes in exogenous factors than changes in the productivity of OFT officials. This is illustrated by recent US experience. During an OFT visit to Washington in November 2000, both the FTC and the Antitrust Division of the DoJ noted that their consumer savings estimates were swamped by the two or three largest cases (by turnover) in the year. For example, in 1998 the Lockheed Martin/Northrop Grumman merger was challenged. This was the single largest proposed merger ever challenged by the Federal authorities.¹⁴³ This meant that in the following year, consumer saving estimates were significantly lower – not because productivity had fallen, but simply because the mergers that were challenged involved lower turnovers.
- 7.76 Furthermore, if the OFT has the incentive to increase consumer savings year on year, then there is a risk that a consumer saving target becomes a *turnover target*. The OFT should not be encouraged to pursue very weak cases in large turnover markets just to bump up its consumer saving targets. Taking action in small markets may have an important demonstration effect. While this is not strictly speaking a deterrent effect, since the OFT seems likely to hear about most mergers that are seriously contemplated, it is important to establish and confirm a precedent that mergers will not be cleared simply because the turnover involved is small. This should encourage the parties to think for themselves about how best to overcome any competition concerns and structure their merger proposals accordingly.
- 7.77 Having dismissed consumer savings in mergers as a performance indicator, this is not to argue that consumer savings estimates, and the techniques used to derive them, are not useful. First, as noted above, where analysts are confident that they understand the assumptions and any biases in the simulation method, estimates of the price rise could form part of the case analysis itself. Second, consumer savings estimates might be used in a (simplistic) cost benefit analysis, in which the conservative estimate of consumer savings should be significantly greater than (say) government expenditure on the competition authorities.

¹⁴³ Antitrust Division, Congressional Submission for Fiscal Year, 2001, page 71.

Endnote 1 to Chapter 7: Tomkins plc and Kerry Group plc¹⁴⁴

The merger

The MMC was asked to consider the acquisition by Tomkins of enterprises previously under the control of Kerry. Tomkins is an international holding company which owned 12 flour mills in Great Britain, 11 of which operated by Rank Hovis (RH)¹⁴⁵. Tomkins also owned British Bakeries, producing brands such as Hovis, Granary, Mothers Pride and Nimble.

Kerry had recently acquired from Dalgety Food Ingredients: the Ingredients Group and the Milling Group. The Milling Group included Spillers Milling, which controlled 7 flour mills. The Ingredients group included one mill. Of the eight total mills it owned, Kerry agreed to sell 6 to Tomkins¹⁴⁶.

Turnover in relevant market

RH's turnover in 1997 was £257m (of which its profit was £35.8m). Spillers Milling's (SM) turnover in year to 30 June 1997 was £124m (of which its profit was £11.1m) on the 6 mills that were sold to Tomkins (2.10).

Market definition

The market under consideration was the supply of flour in UK (2.12). There were relatively few exports and imports (2.13) and overlapping chains of substitution were found to link delivery markets¹⁴⁷. Flour could be distinguished according to the following factors.

Hard and soft flour. Bakers (the principal users of flour)¹⁴⁸ only used hard flour although supply side substitution from soft to hard seemed possible (2.22-2.23). Soft flour producing mills could upgrade to producing hard flour at a cost of £0.5m to produce hard flour (2.15).

¹⁴⁴ Cm4031, September 1998.

¹⁴⁵ 2.5-2.7. The mill not operated by RH specialised in the production of flour for pasta (3.27).

¹⁴⁶ It also sold with Fleming Howden, a wholesale business in Scotland distributing flour and bakery ingredients but this was not found to be a competition concern (2.12).

¹⁴⁷ Delivery distances were typically 60-80 miles. However, there were significant overlaps in delivery areas and chains of substitution linked mills in different regions. It was argued to be arbitrary to define markets on a regional basis (2.26).

¹⁴⁸ 65 percent of the flour produced in the UK was used for breadmaking (2.19).

In-house and free flour. In-house flour was used when mills were vertically integrated. The merger had no implications for in-house flour (2.24). However, free flour was found to be crucial for non-integrated bakers.

TABLE 7.1.1 – ESTIMATED MARKET SHARES, SUPPLY OF FLOUR

	<i>Tomkins – formerly RH's 11 Mills</i>	<i>Tomkins – formerly SM's</i>	<i>Allied Mills (ABF)¹⁴⁹</i>	<i>Big 2 (ABF and Tomkins)</i>
All Flour	23.8	11.1	26.2	61.1
Free Flour	17.4	21.22	19.4	58.8

Source: Table 2.1, page 9 op.cit. It is unclear as to whether these shares are based on volume or value (see note to table 4.5 on page 43).

The report does not indicate the market shares for the remaining players in the market. However, Tomkins noted that 24 millers were leading supra-regional and regional competitors to RH (6.35). This was out of a total of 31 companies and 73 mills (2.14) of which the 29 independent millers owned 40 mills (2.48). In the free flour market, which was the market where the competition concerns arose, only Heygates had a market share exceeding 5 percent (4.41). We were therefore able to arrive at a ballpark figure for the HHI pre and post merger. The increase in the HHI is estimated to be 737.8.

TABLE 7.1.2 – ESTIMATE OF MARKET SHARES IN THE FREE FLOUR MARKET

<i>Firm</i>	<i>Estimated market share, %</i>
SM (Tomkins)	21.2
RH (Tomkins)	17.4
Allied Mills	19.4
Heygates	7.0*
'Other' (21 regional and supra-regional competitors)	35.0*
Pre-merger HHI (assuming 'others' have equal market shares)	1235.9*
Post merger HHI (assuming 'others' have equal market shares)	1973.7*

*Authors' estimate

¹⁴⁹ Allied Mills, a subsidiary of Associated British Foods (ABF).

Competition assessment

The merger gave rise to a significant increase in concentration in supply of flour as a whole and especially free flour. There were already high market shares of the previous leading three suppliers. The merger concentrated this share in the hands of two players, with RH accounting for the most significant share (2.30).

Prior to the merger, SM was the largest miller in the UK without an in-house bread bakery business¹⁵⁰. It was the market leader in the free flour market and only independent with national coverage (2.25). Moreover, SM was a key competitor in the free flour market through its: contribution to product development of independent bakers; higher quality and service; and lowest supply price for main grades of flour. RH's strategic plan refers to SM as 'catalyst for much of recent price erosion' and adds that one of RH's key tasks is to 'restore market discipline' (2.31).

The strategy document also suggests a defensive rationale for the acquisition – to maintain status quo with Allied Mills. It argues that the worst case scenario 'would be an international buyer with a different commercial agenda' (2.34).

The MMC argues that: 'When there were three national players competition was, in our view, sufficient to ensure that the decline in wheat costs over the last few years were passed on in lower flour prices¹⁵¹, and that some of the other cost savings achieved by millers were reflected in lower prices' (2.39)¹⁵².

Other players were found to be too small and did not constitute a strong competitive constraint for the national players (ie RH and ABF), notwithstanding their recent rise in market share. They could not offer a wide enough range or national coverage and there appeared to be a reluctance to expand, without the assured customer base of some in house sales (2.41-2.44).

New entry. New entry was found not to be expensive in that a new mill of average size would cost £10m. However, new entry would most likely be on the back of a secured customer base and so was thought unlikely to generate much free flour. Acquisition was more likely than new entry (2.49-2.50).

¹⁵⁰ Prior to the merger RH used 60 percent of its flour in-house and ABF also used 60 percent in house (2.16). SM used some flour in-house but not from the mills sold to RH.

¹⁵¹ Between 70 and 75 percent of the production cost of flour was due to the cost of wheat. The price of the latter had been falling leading to a decline in the price of flour in real terms over the previous 5-10 years (2.17).

¹⁵² Having said this, competition was arguably not as intense as it could have been. Some of the bakers questioned by the MMC suggested that there had been price leadership by the major firms, although this was disputed by the millers (2.37).

Economies of scale. RH argued that the smaller independent mills were not at a disadvantage as the optimal milling plant was not very large. Tomkins argued that since the main cost was wheat, a variable cost being some 70-75 percent of total costs, economies of scale were not important (4.63)¹⁵³.

Capacity. Allied Mills' capacity was at 28,597 tonnes a week (1.5m tonnes a year of hard and soft flour) equal to 27.3 percent of national installed capacity (6.31). This implied that total capacity was 5.49m tonnes a year. UK demand was around 5.0m tonnes a year (6.45). This suggests that spare capacity is around 10 percent. RH estimated spare capacity at 15 percent. Some spare capacity was required to meet seasonal and other expected surges in demand (4.62). Millers suggested that excess capacity in independent mills existed (5.139-5.141).

Buyer power. The effect of the merger was considered according to each different type of customer (2.28). While grocery multiples had countervailing power (grocery multiples sold some 75 percent of bread sold in UK), their power would not have been able to completely offset a rise in price (2.56-2.59). Independent bakers who did not have buyer power might not have been able to compete as effectively with grocery multiples – they would have had greater dependence on integrated millers (2.73).

Vertical issues. Since RH and ABF both had downstream interests this, it was argued, might have increased the scope for price discrimination and reduced the incentives to assist independent bakers with product development (2.62).

Efficiencies. SM needed a bit of investment and Tomkins would have been likely to achieve significant improvements in efficiency (2.11 and 2.18). While accepting this, the MMC's view was that 'given the loss of competition resulting from the merger, it is unlikely that RH would be under pressure to pass such savings on to consumers even in the longer term and we therefore believe there are *no offsetting benefits* to the public interest from the merger' (2.76, emphasis added).

The MMC is not suggesting that efficiency benefits are given a zero weight. Instead the MMC makes the point that another buyer could have also achieved these efficiency gains. The acquisition by Tomkins was not necessary to achieve any benefits of rationalisation (2.35).

¹⁵³ There was a suggestion that national millers could streamline production by specialising mills to produce one grade of flour at each mill (5.139).

In sum, the MMC found that competition had been important in passing on the falling price of wheat to consumers and so would remain important to pass on lower costs resulting from rationalization. The merger was found to be likely to lead to a higher price of flour and of bread. Consumers may have faced less choice to the extent that independent bakers would be adversely affected (2.70-2.74).

Recommendations

The MMC considered appropriate remedies and whether they were proportional to the competition problems posed. The MMC recommended divestment of mills on a scale large enough to compete nationally, maintain adequate R&D and maintain a large enough customer base. This should also had to be large enough to allow rationalization (production from fewer but larger mills) to take place.

To meet these objectives four mills were recommended to be divested to a buyer approved by the DGFT. The Cambridge mill (where production of hard flour was low) was not permitted to increase production of hard flour for a year to prevent RH undermining the customer base of the divested group.

Endnote 2 to Chapter 7: Thoughts on the deterrent effect in mergers cases

In quantifying the deterrent effect there are two difficult issues. The first might be termed the 'spill-over' deterrent effect. Where the competition authorities take action against a particular anti-competitive merger, does this spill-over in such a way that firms in other (probably related) markets are less likely than they were beforehand to consider anti-competitive mergers?¹⁵⁴ The second might be described as a 'global' effect. This asks the following question. To what extent does the very existence of a diligent and active merger policy deter firms from even contemplating potentially anti-competitive mergers?

A simple framework

Suppose that any merger proposal must be cleared by the authorities before it can proceed¹⁵⁵. In addition, assume that firms know whether any merger would be anti-competitive, irrespective of whether or not the OFT has assessed the merger proposal. Under these conditions we would expect that firms weigh up the gains and likely costs from proposing an anti-competitive merger.

We assume that the gain equals the higher profits which result from higher prices after the merger. The *expected* gain is therefore the incremental profit (I) arising from the merger multiplied by the probability of getting an anti-competitive merger cleared (p^c).

To keep things simple, we further assume that there are no sunk costs involved in the actual process of merging. The only sunk costs that arise from the merger are the costs, S , of providing the information to the OFT. This information is used by the OFT in its analysis of the proposal. (We assume that the OFT has the final decision and does not refer to the Competition Commission).

It follows that the OFT will hear about an anti-competitive merger proposal if:

$$p^c \cdot I > S \tag{7.2.1}$$

If the OFT has a perfect monitoring ability, and so detects any anti-competitive merger, then p^c is zero. This means that unless S is trivial, no anti-competitive mergers will ever be contemplated. The deterrent effect is perfect. On the other

¹⁵⁴ On deterrence, outside of merely mergers, see also Chapter 8 and paragraphs 9.24 – 9.26.

¹⁵⁵ In practice, the OFT analyses some mergers which have already taken place but, for simplicity, assume firms must seek approval before merging.

hand, if – as is likely – resource constraints at the OFT mean that occasionally some anti-competitive mergers slip through the net, then some anti-competitive mergers will take place. Nevertheless, the lower p^c , the higher the deterrent effect.

Let us now relax some of the assumptions. Suppose that the clearance procedure can be split into two stages: the first, A, is an informal meeting in which the parties to the merger present their proposal to the OFT in a two hour meeting; the second, B, requires detailed examination by the OFT. From the firm's point of view, stage A involves sunk costs of S^A while B costs S^B .

At stage A the likelihood that an anti-competitive merger will be allowed through to stage B is p^A , while, given that stage B has been reached, the probability that an anti-competitive merger will be cleared is p^B .

The OFT will hear about an anti-competitive proposal if:

$$p^A \cdot p^B \cdot I > S^A + S^B \quad (7.2.2)$$

Suppose that it is rare, on the basis of a two hour meeting, that the OFT has enough information to state that the proposal is *unlikely* to be cleared, unless the proposal refers to a market which the OFT knows very well, for example because it has looked at it recently. Therefore, for most mergers, p^A is close to 1. Suppose also that the merging firm does not face significant costs at stage A so that S^A is almost zero. Under these assumptions (7.2.1) is more or less the same as (7.2.2), where p^B is equal to p^c .

There are two implications of this result. First, given that the OFT does not have a perfect ability to detect anti-competitive mergers¹⁵⁶ and that stage A is almost costless for merging firms, then for any anti-competitive merger that satisfies (7.2.2) the OFT will at the least *hear* about it at stage A, even if it does not go on to analyse it in detail at stage 2. Second, because there is no scope to *penalise* firms for raising anti-competitive merger proposals, the only cost firms face is the cost of providing information to the OFT to help in the investigation¹⁵⁷. In the discussion below, we explore deterrence in light of the realities of the OFT and, where relevant, link the discussion to the framework set out in this subsection.

¹⁵⁶ We ignore the possibility that the OFT might incorrectly block a benign merger.

¹⁵⁷ In further work, we might explore the model further – for example, by assuming that p^B is a function of I and S^B . This suggests that the higher the likely profits post-merger, the more likely it is to be detected as anti-competitive, and, the higher the costs spent by the merging parties, the more likely they are to hoodwink the OFT into clearing the merger.

Spill-over deterrent effects

Here we address the issue of how to deal with consumer saving estimates in cases which may have a spill-over deterrent effect. In other words, as a result of the new case, does deterrence spill over in such a way that firms in other markets are less likely than they were beforehand to consider anti-competitive mergers?

Spillover effects may occur because a case establishes new precedent (or clarifies existing precedent). For example, suppose a case enhances the reputation of the competition authorities for taking a tough stance against anti-competitive mergers in oligopolies where there are only a few firms. If so, this may lead to additional deterrent effects because firms expect that future mergers in oligopolistic markets, which were once likely to be cleared, will now be subject to greater scrutiny. This in our model above would be represented by an exogenous fall in probability of clearance and (under the above assumptions) would mean that firms are less likely to bring anti-competitive proposals to the OFT.

We might then argue that because the new law has taken a tougher stance against anti-competitive mergers¹⁵⁸, we should not only account for the consumer savings arising in the particular case at hand, but also account for savings that arise from increased deterrence. In our view, however, it would be unwise (and very difficult) to try to measure these new deterrent effects in a consumer saving estimates.

To see why, let us take an imaginary collective dominance case. Suppose that, in market X, there is a merger which would reduce the number of firms from four to three, and that it is blocked for fear that it would be conducive to coordinated behaviour and higher prices. If we were to try to capture deterrent effects, we might argue that in other markets with four firms, we would deter several anti-competitive mergers which would bring about coordinated effects. However, suppose we find a market, Y, which on the basis of (say) market shares and the number of firms looks similar to X. In market Y, we cannot tell whether any firms would have planned to merge absent the judgment in market X. Furthermore, even if they did merge, market Y may differ in a material way from market X such that coordinated behaviour would be unlikely and the merger should be cleared¹⁵⁹.

¹⁵⁸ We assume here that benign mergers are not blocked.

¹⁵⁹ A possible example of a spill-over effect would be to argue that by blocking a merger in a market which has four firms, this sends out a signal that a merger in the same market to two or even one firm would also be blocked. Given that we have the ability to simulate the price rise resulting from a merger which takes us from four to three firms, it should be relatively simple to simulate a price rise resulting from a merger to monopoly. The difference between the simulated price rise for the first merger and the monopoly price would then arguably be an upper bound measure of the spill-over deterrent effect in that particular market. However, this approach is subject to the same problems of the counterfactual described earlier. It is not clear that there would be a merger to monopoly, even if the merger from four to three was allowed to proceed. For example, the optimal firm size may not be consistent with a monopoly because significant diseconomies of scale exist beyond a certain size. .

Global estimate

A global estimate of deterrence asks the question: to what extent do anti-competitive mergers, that would have occurred absent merger *policy*, neither occur nor come to the attention of the competition authorities due to the expectation that they would be blocked? If the global deterrent effect is strong, then the number of cases where action is taken is just the tip of an iceberg – many more anti-competitive mergers are contemplated, but not pursued. Consumer saving estimates based on only merger cases looked at by the authorities would significantly underestimate the impact of policy¹⁶⁰. Below we address factors which will affect the global deterrent effect of merger policy.

(i) Case-by-case analysis and uncertainty

Mergers differ from cartel investigations in that cartels are known *ex ante* by the parties to be illegal. However, in the case of some mergers, parties (and indeed the authorities), may be genuinely uncertain as to whether a proposed merger would be anti-competitive. This can weaken the deterrent effect. To see why, note that, in relation to the model above, uncertainty would mean that firms over-estimate the probability of clearance¹⁶¹. This means that they would be more likely to bring anti-competitive proposals to the OFT than if they better understood how the authorities dealt with anti-competitive mergers. Deterrence is weaker in that, given the number of anti-competitive mergers contemplated does not change, the OFT *hears about* more of them.

Uncertainty also affects the authorities. It is not generally possible to give precise guidelines as to when a particular merger would be cleared, which means that mergers will typically be analysed on a case by case basis¹⁶². This undermines the deterrent effect because merging firms may believe either that they have a genuine case, or that they can persuade the authorities that a borderline case should be cleared¹⁶³.

¹⁶⁰ We note here that non-merger policy may also impact on merger policy and this may affect the counterfactual. For example, increases in the intensity of price competition through, say, a tougher stance against cartels may induce firms to merge more often than they otherwise would have done. See the discussion of Symeonidis (2000) in Chapter 8.

¹⁶¹ We assume that there is no uncertainty in relation to benign mergers.

¹⁶² We note that this may well be a price worth paying in order not to deter too many benign mergers.

¹⁶³ For example, in the model above, the probability of clearance could increase as firms spend more on their representations to the OFT.

In some cases, firms will seek advice from antitrust practitioners (eg from firms specialising in competition law or competition economics). It may then be possible to survey antitrust practitioners to find out how often they advise against taking forward an anti-competitive merger. This would give some idea as to how many mergers are deterred. We would have to be careful to avoid double counting the cases where the OFT had also heard about the proposal¹⁶⁴.

(ii) Other factors affecting deterrence

We noted above that parties can seek informal meetings with OFT officials, perhaps at little cost to themselves. This might suggest that, rather than being completely deterred from their merger proposal, parties may have an incentive to at least run their proposal informally past OFT officials. (We expect that informal guidance cases account for over 10 percent of cases considered by the OFT).

In particular, this will be the case where only a small part of the merger is likely to raise competition concerns. When multiproduct firms merge, competition concerns may arise in only one or a few markets where there is significant overlap between the products of the merging firms. If the turnover affected by these areas of overlap is small in relation to the turnover affected by the whole merger, one might imagine that the deterrent effect does not play a major part. Given that benign business strategies are driving the merger and that the overlap of concern is a by-product of the merger (i.e. not a driving force for the merger), it seems likely that merging parties would either proceed with the merger or at the least seek some form of guidance from the OFT. This is because undertakings in lieu of a reference or divestment in the area of overlap might be sufficient to allow the rest of the merger to proceed.

Summary

Where blocking a merger might create spill-over effects which enhance deterrence in similar industries, in general it is not desirable to quantify such effects and add them to the consumer saving estimate for that case. This is due to the difficulty of identifying the counterfactual.

Where potentially anti-competitive mergers are abandoned without the OFT's knowledge, it may be because antitrust practitioners advise the firms against proceeding. If so, a survey of antitrust practitioners may provide some handle on this deterrent effect.

¹⁶⁴ This is because parties considering a merger may seek advice from the competition authorities themselves. In the UK, for example, parties may seek informal meetings with OFT officials as to whether a proposal would likely be referred to the Competition Commission. More formally, they can submit merger proposals to the OFT (for public mergers) or seek confidential guidance (for mergers which are not in the public domain).

However, three factors suggest the deterrent effect may be small. First, where mergers are analysed on a case-by-case analysis (and authorities cannot analyse each case perfectly), this can undermine the deterrent effect as there will always be a chance that the merging parties can persuade the authorities to clear an anti-competitive merger. Second, where the sunk costs of obtaining an initial view of the merger from the OFT are small, as is likely to be the case due to the availability of informal guidance, the OFT seems likely to at least hear about a merger. Third, a merger of multi-product firms may not be deterred if the need to address a competition concern applies in a market which is not the driving force of the merger.

Nevertheless, even if the above factors mean that the OFT is likely to hear about most anti-competitive mergers that are seriously contemplated, while not strictly speaking a deterrent effect the OFT can nevertheless create a demonstration effect. This effect might, for example, confirm a precedent that anti-competitive mergers will not be cleared simply because the turnover involved is small. This should encourage the parties to think for themselves about how best to overcome any competition concerns and structure their merger proposals accordingly.
