New Developments in the Analysis of Market Structure

Proceedings of a conference held by the International Economic Association in Ottawa, Canada

Edited by

Joseph E. Stiglitz

and

G. Frank Mathewson

The MIT Press
Cambridge, Massachusetts

First MIT Press edition, 1986

First published in 1986 by THE MACMILLAN PRESS LTD

Printed in Hong Kong

Library of Congress Cataloging in Publication Data
Main entry under title:
New developments in the analysis of market structure.
Bibliography: p.
Includes index.
1. Industrial organization (Economic theory)—Congresses. 2. Vertical integration—Congresses.
3. Oligopolies—Congresses. 4. Competition—Congresses.
I. Stiglitz, Joseph E. II. Mathewson, G. Frank.
III. International Economic Association.
HD2326.N43 1986 338'8 85-4246
ISBN 0-262-19241-1 (hard)
0-262-69093-4 (paper)

Content

ı structure that was
premont–Gabszewicz

the problem of cartel
vels – competition in
the determination of
The ways that firms
s was unspecified, and
Individual stability,
condition for equilib-

aper of the dominant-
nly stable syndicate
icular, why this num-
firms in the market.
from a more general
ere the existence of a
reason to expect the
e independent of the
ed that this particular
and which was linear
onsumers.

nd Weymark, J. (1982)
Journal of Economics,

9 Practices that (Credibly) Facilitate Oligopoly Co-ordination[1]

Steven C. Salop

GEORGETOWN UNIVERSITY LAW CENTER, USA

I INTRODUCTION

It is now well established in both the economic and legal literature that successful price co-ordination (either express or tacit) is not inevitable – even in highly concentrated industries protected by insurmountable barriers to entry. The key to this insight is the recognition that even though oligopolists' fates are interdependent, individual self-interests are not perfectly consonant. Ãs a result, oligopolists may find it difficult to agree on a mutually acceptable co-operative outcome, achieve that outcome smoothly, and maintain it over time in the face of exogenous shocks and private incentives to deviate. In the current language of industrial organisation, the joint profit-maximising point may not be a Nash equilibrium.

The likelihood of successful co-ordination may be increased by the adoption of industry practices that increase oligopolists' incentives to co-operate and reduce their incentives to compete, despite their divergent interests. Contractual provisions can add credibility to such tacit agreements, because they will be enforced by courts. Anti-trust commentators refer to such practices as 'facilitating devices'. Some courts have called them 'plus factors'. Economic theorists can model these practices as profit penalties and pricing constraints that have the effect of altering the oligopoly equilibrium point. Analysis of these practices is the subject of this chapter.

The rest of the chapter is organised as follows. Section II briefly

reviews the analytic approaches to strategic interaction in oligopolistic industries. The material in this section is not new, but it provide a useful foundation for analysing facilitating practices. The practices are introduced in Section III. Sections IV and V discuss two examples of contractual provisions that can function as facilitating devices – 'most favoured nation' clauses and 'meeting competition' clauses. A number of other practices are also discussed briefly in these two sections. Section VI discusses the role of 'meeting competition' clauses in credible entry deterrence. Rationales for considering the practices in terms of their effects on efficiency are taken up briefly in the concluding Section VII.

II THE SIMPLE ANALYTICS OF TACIT CO-ORDINATION: REVIEW

Successful oligopolistic co-ordination consists of three elements – *agreement* about the co-operative outcome, *achievement* of that outcome, and *maintenance* of the outcome over time, in the face of changing conditions and private incentives to compete.

Agreement is difficult whenever firms' interests do not exactly correspond. It may be true that raising prices may increase the industry's joint profits. However, unless there is a binding profit-sharing arrangement, higher profits for one rival may come at the others' expense. When non-price variables such as product design, delivery schedules and customer service must also be set, the agreements become unavoidably complex. The desire to indulge in price discrimination also complicates the agreement. Moreover, in a dynamic context, the agreement must be constantly renegotiated or must be made contingent on changing conditions. Otherwise, the agreement will become less profitable when changes occur. Of course, the difficulties in reaching an agreement are compounded when laws prohibit the negotiation of express agreements. In place of open negotiations, the oligopolists then rely instead on tacit understandings subtly signalled through newspaper interviews and at trade association meetings.

Once agreement is reached, the co-operative outcome must still be achieved. This may be a trivial matter for a legal cartel that can openly rely on a court-enforced contract. However, this is not the case for illegal price fixing schemes and for tacit co-ordination. Without such contracts, agreements may not be 'binding'.

The familiar model
trates these difficulties
call them Ethyl and D
at identical costs.[2] Sup
or some other insurm
impossible. To elimin
by asymmetric positio
mands for the rivals' p
space' for each rival t
horizon, or $(p_1, p_2, \ldots$

Our analysis focuses
equilibria. A *credible e*
and maintained over t
are unable to commit t
in every time period
maximises the presen
consideration its rivals
simple Nash–Cournot
credible equilibrium o
relative credibility em
equilibrium (or not) v
some degrees of strate
some firms may be m
others, the analysis is
bility. It should also b
results can also be de
static models.

(A) TACIT CO-ORDINA

To facilitate the expo
simple examples. In t
price in each period fr
Table 9.1 illustrates t
Dilemma. In this exar
(p_H) or a low price (p_L

The entries in Table
different pricing combi
are chosen for illustra
come by the specific p
is entered first. Thus,

c interaction in oligop-
ion is not new, but it
cilitating practices. The
ns IV and V discuss two
function as facilitating
d 'meeting competition'
lso discussed briefly in
role of 'meeting compe-
Rationales for consider-
efficiency are taken up

T CO-ORDINATION:

sts of three elements –
achievement of that out-
er time, in the face of
o compete.
nterests do not exactly
rices may increase the
ere is a binding profit-
rival may come at the
such as product design,
st also be set, the agree-
esire to indulge in price
ent. Moreover, in a dy-
nstantly renegotiated or
ditions. Otherwise, the
hen changes occur. Of
ement are compounded
s agreements. In place of
instead on tacit under-
r interviews and at trade

ive outcome must still be
a legal cartel that can
However, this is not the
for tacit co-ordination.
t be 'binding'.

The familiar model of a repeated Prisoners' Dilemma game illustrates these difficulties. Suppose the industry consists of two firms – call them Ethyl and DuPont – which produce differentiated products at identical costs.[2] Suppose that as a result of government regulation or some other insurmountable barrier to entry, additional entry is impossible. To eliminate the additional analytic complexity created by asymmetric positions in the industry, assume that consumer demands for the rivals' products are symmetric.[3] Consider the 'strategy space' for each rival to be the set of its prices over an infinite time horizon, or $(p_1, p_2, \ldots)$.

Our analysis focuses on the *relative credibility* of possible dynamic equilibria. A *credible equilibrium* is an outcome that can be achieved and maintained over time by firms that exhibit foresight, but which are unable to commit themselves in advance to future prices. That is, in every time period each firm is assumed to select a price that maximises the present discounted value of its profits, taking into consideration its rivals' likely best responses to its price choice. The simple Nash–Cournot equilibrium point may or may not also be a credible equilibrium outcome, as will be discussed below. The term *relative* credibility emphasises that an outcome may be a credible equilibrium (or not) with respect to some information sets and to some degrees of strategic sophistication but not to others. Because some firms may be more or less informed and sophisticated than others, the analysis is not restricted to a single definition of credibility. It should also be emphasised at the outset that many of these results can also be derived as simple Nash equilibria in analogous static models.

(A) TACIT CO-ORDINATION AND THE PRISONERS' DILEMMA

To facilitate the exposition, we shall illustrate these concepts with simple examples. In these examples, each duopoly firm chooses its price in each period from among a finite set of prices (generally two). Table 9.1 illustrates the simplest 2 × 2 structure for the Prisoners' Dilemma. In this example, each firm can select either a high price (p_H) or a low price (p_L).

The entries in Table 9.1 give the firms' profits in a single period for different pricing combinations in that period. The particular numbers are chosen for illustrative purposes only. We denote a pricing outcome by the specific pair of prices chosen by the rivals. Ethyl's price is entered first. Thus, the price pair (p_H, p_L) indicates that Ethyl

TABLE 9.1 THE PRISONERS' DILEMMA

		DuPont			
		p_H	p_L	p_H	p_L
Ethyl	p_H	100	−10	100	140
	p_L	140	70	−10	70
		Ethyl's pay-offs		DuPont's pay-offs	

charges p_H and DuPont charges p_L. However, joint profits for the price pair (p_H, p_H) exceed joint profits both for the off-diagonal pairs (p_L, p_H) and (p_H, p_L) and for the diagonal price pair (p_L, p_L). We therefore denote (p_H, p_H) as the joint profit maximising (or *co-operative*) point. A co-operative agreement would require that Ethyl and DuPont each charge the high price p_H. We denote (p_L, p_L) as the *competitive* point.

Inter-seller price setting contracts generally violate the anti-trust laws. Lack of a binding contract may make it difficult for DuPont and Ethyl to co-ordinate their behaviour even temporarily, even if they reach a meeting of the minds on the mutual desirability of the co-operative strategy p_H. Beginning from the competitive outcome (p_L, p_L), if the dates of the rivals' price increases to p_H are not co-ordinated, then the price leader's profits are reduced during the transition period. In Table 9.1, if Ethyl raises its price first, its profits fall to −10 until DuPont follows with its own price increase. Of course, DuPont's profits rise to 140 during the transition. Thus, DuPont has every incentive to delay its price increase. Fear of further delays may convince Ethyl that it should return to p_L or should forego the price increase to begin with. As a result, the process of attaining the joint profit point may be interrupted.[4]

It may appear that the 'transitional' difficulties of achieving the co-operative outcome are only a one-time problem. However, this view overlooks the dynamic elements of oligopoly interaction. As cost and demand parameters change over time, the joint profit-maximising point changes as well. Thus, oligopolists face repeated transitional problems. As we demonstrate below, certain industry practices can facilitate the transitions and so make co-operation more credible, allowing the price pair (p_H, p_H) to be achieved repeatedly.

Once achieved, we have the familiar Prisoners' Dilemma – the co-operative outcome must be maintained, despite the oligopolists' incentives to compete. Of course, this problem is similar to the difficulties faced in reaching the joint profit point initially. The co-operative point $(p_H\, p_H)$ is not a simple Nash equilibrium for the

single-period Prisoners' Dilemma game. For example, if Ethyl lowers its price to p_L, its profits rise in the short run to 140.

Following Stigler (1968) by viewing the model as a repeated game complicates the analysis as follows. Given the pay-off structure of Table 9.1, once DuPont detects Ethyl's price reduction, it has an incentive to match the price cut; this strategy raises its profits from -10 to 70. Assuming that there is a sufficient time lag between Ethyl's price cut and DuPont's response, a price cut by Ethyl is profitable. This destabilises the co-operative outcome. DuPont's incentive to cut price and Ethyl's incentive to match that cut, are symmetric, of course. In short, in the repeated game, unless detection lags are sufficiently short, each oligopolist has an incentive to cheat. Thus, the co-operative outcome may not be a credible dynamic equilibrium for the repeated game.

It is well known that the incentive of one firm – say Ethyl – to deviate from the co-operative solution depends on its relative profits in the four states (p_H, p_H), (p_L, p_H), (p_L, p_L), and (p_H, p_L) and the relative time intervals spent in each state. The time intervals are themselves endogenously determined by the likelihood, and also the speed of detection of price changes and of the response by one's rival as well as by the dynamics by which the joint profit point might be reached again if and when co-operation breaks down. Formally, denoting the profits to Ethyl at the price pair (p_i, p_j), as V_{ij}, and assuming that the joint profit outcome can *never* be achieved again once it is lost, Ethyl will deviate from p_H if

$$V_{HH} < bV_{LH} + (1 - b)V_{LL} \tag{1}$$

Here the weight b is endogenous and depends upon all the relative time intervals and on Ethyl's time and risk discount rates. The expected relative time intervals depend in turn on Ethyl's expectations about DuPont's behaviour and, hence on DuPont's own incentives.[5]

Most formal analyses of tacit co-ordination have focused on the issue of detecting deviations from the co-operative strategy. Stigler's (1968) model is the classic work, followed by Orr and MacAvoy (1965) on the profitability of cheating given exogenous detection lags. Osborne (1976) analyses a set of oligopoly decision rules that induce stability. More recently, Green and Porter (1981) have erected a stochastic demand model in which both false positive and false negative signals of cheating can occur, and in which the length of price wars (i.e., the time interval spent at (p_L, p_L)) is endogenously determined.

In most formal models, a retaliatory response occurs immediately, once deviations away from the joint profit point are detected.[6] Indeed, this incentive to retaliate has been explicitly built into the Table 9.1 pay-off matrix. On the other hand, if the strategy space is expanded to include *selective discounts* and other limited cheating tactics, retaliation may not be inevitable even after discounts have been detected.[7] First, Ethyl's discount may be offered to a marginal DuPont customer, that is, one to which DuPont had been charging a price approximately equal to marginal cost (including service costs). Even more germane for our purposes is the fact that some contractual provisions can make retaliation more costly. As discussed in detail in the following sections, *meeting competition* and *most favoured nation* clauses in sales contracts can affect both the incentives to discount and the incentives to retaliate against discounts that are detected.

Before turning to an analysis of these contractual provisions, we first examine cases in which tacit co-ordination is successful.

(B) PURE TACIT CO-ORDINATION

Despite all the difficulties, successful tacit co-ordination is not impossible. Pay-offs may have a structure that permits the co-operative outcome to be a credible (or even a simple Nash) equilibrium. This can occur in two ways. First, as was discussed in the context of the Table 9.1 pay-off structure, if the detection lag and the discount rate are small enough and if Vp_{HL} and Vp_{LH} are sufficiently small relative to V_{LL} and Vp_{HH}, then the co-operative point (p_H, p_H) may be a credible dynamic equilibrium.

Alternatively, if V_{LH} is less than V_{HH}, then we can also have (p_H, p_H) as a simple Nash equilibrium. This is illustrated in Table 9.2 below, where Ethyl and DuPont's respective off-diagonal pay-offs are reduced from 140 to 90.

Given this pay-off structure, the co-operative outcome (p_H, p_H) can both be achieved and maintained, if firms are sophisticated strategists. Beginning at (p_L, p_L), if Ethyl raises its price to P_H, its profits fall to -10. However, unlike the position in the standard Prisoner's Dilemma, DuPont now has an incentive to raise its price immediately in order to increase its profits from 90 to 100. Knowing this, it is in Ethyl's interest to raise its price openly. Thus, the competitive equilibrium outcome (p_L, p_L), can be avoided; it is not a credible equilibrium. Of course the competitive point (p_L, p_L) remains a simple Nash equilibrium.

TABLE 9.2 THE PURE TACIT CO-ORDINATION

		DuPont			
		p_H	p_L	p_H	p_L
Ethyl	p_H	100	−10	100	90
	p_L	90	70	−10	70
		Ethyl's pay-offs		DuPont's pay-offs	

The analysis for maintaining the co-operative outcome is analogous. In contrast to what happens with the standard Prisoner's Dilemma, if Ethyl lowers its price to p_L, its profits fall from 100 to 90; its incentive to discount is therefore eliminated. Not even an unsophisticated Ethyl will lower its price. DuPont's incentives are identical. Thus, in Table 9.2, (p_H, p_H) is a simple Nash equilibrium as well as a credible equilibrium. It can be both achieved and maintained if DuPont and Ethyl are sufficiently sophisticated.

III PRACTICES THAT FACILITATE OLIGOPOLISTIC CO-ORDINATION

Unfortunately for potential colluders, pay-off matrices do not always satisfy the pure tacit co-ordination structure of Table 9.2. Nor are detection lags always short enough to make a credible equilibrium out of the repeated version of the Prisoners' Dilemma game in Table 9.1. Therefore, as an alternative, the oligopolists must consciously or fortuitously discover and implement some means of restructuring their pay-offs, so as to facilitate the achievement and maintenance of the co-operative outcome. We refer to these as *facilitating practices*.[8]

There are two distinct effects of facilitating practices, namely *information exchange* and *incentive management*. Although particular practices often combine elements of both roles, it is useful to distinguish between them. Because the information exchange effect is better understood, we shall discuss it only briefly and focus instead on incentive management.

Information exchange facilitates both explicit and tacit co-ordination by eliminating uncertainty about rivals' actions. Classic examples of information exchanges are inter-seller verification of price quotations and advance notice of price changes. In each case, the exchange of information shortens or eliminates detection lags and, therefore, the time interval spent in off-diagonal price-pair states. By decreasing the transitional losses from price rises and the

transitional gains from price discounts, incentives are altered in such a way as to make the joint profit outcome easier to achieve and maintain.[9]

The incentive management role of facilitating practices functions by *directly* altering the structure of the pay-off matrix, rather than by working through the medium of information exchange. By restructuring pay-offs, the incentives for a firm to offer price discounts or to raise prices may be directly affected.[10] Similarly, a firm may change its incentives in order to match price changes initiated by its rivals, thereby affecting its rivals' incentives to initiate such price changes. In this way, the adoption of facilitating practices can convert competitive oligopoly outcomes into simple Nash (or credible) equilibria at the co-operative point.

For example, consider the following static model. Let $V_i(p_1, p_2)$ denote the profit function for firm i ($i = 1, 2$), given the prices p_1 and p_2 respectively for the two firms.[11] Profit-maximisation by each firm implies a simple Nash equilibrium (p_1, p_2) satisfying the respective first-order conditions, or

$$\frac{dV_i}{dp_i} = 0 \qquad i = 1, 2 \tag{2}$$

If $V_i(p_1, p_2)$ is altered, say by the adoption of an incentive management device, the Nash equilibrium changes.

Perhaps the purest example of an incentive management device is a monetary penalty on price discounts. For example, beginning from the Table 9.1 pay-off matrix and an equilibrium at (p_L, p_L), suppose that DuPont and Ethyl each contract with separate third parties. Suppose these contracts require a payment to the third party of a penalty equal to 50 if the firm charges any of its customers a price below p_H, and if that price cut is not matched by the rival seller. These penalties transform the rivals' pay-offs into the Table 9.2 pay-off matrix which has a credible (and simple Nash) equilibrium at (p_H, p_H). The penalty scheme successfully raises industry joint profits, relative to Table 9.1.

Incentive management devices can also be created by the provision of purchase contracts between an oligopolist and his customers. Embedding an incentive management device into a sales contract has a number of advantages. First, the use of a contract (with a purchaser or a third party) allows the oligopolist to make a binding commitment to transform his pay-off matrix. If necessary, a public court will enforce the contract. Thus, the credibility of the promised behaviour

is increased.[12] Moreover, the ability to collect damages gives the buyer an incentive to ensure performance of the contract and to bear the costs of enforcing it. If the buyer is better situated than rivals or third parties to detect price discounts, this can increase the efficiency of enforcement. Of course, more efficient enforcement increases the credibility of a promise.

The obvious question is why rational buyers would be willing to act as accomplices in achieving this possibly anti-competitive conduct. To the extent that the contractual provision makes price discounting less desirable or price increases less risky, it is difficult to see why buyers would agree to clauses that have such an effect.[13] The answer lies in the possibility of designing contractual provisions that are valued by each buyer individually even while they create an external cost to all other buyers. If such clauses can be developed, though each buyer willingly accepts (or even purchases) the clause, the collective acceptance of the clause by all buyers eliminates the individual benefit by stabilising the sellers' joint profit outcome. A court might characterise this impact as a 'free rider effect in reverse'.

We now turn to a number of examples of practices that can transform incentives in this way. It should be noted that these practices sometimes have procompetitive and efficiency benefits as well as potential anti-competitive effects. For the present, we focus on the latter and discuss some of the efficiency benefits in the final section. This choice of emphasis does not reflect a belief that the anti-competitive effects are always larger or more important, or that courts should take a *per se* approach to these practices. Rather, it implies that the subject of this chapter is strategic interaction and oligopoly equilibrium, a careful balancing of benefits against their likely anti-competitive impact is necessarily beyond the scope of the analysis.

IV MOST-FAVOURED-NATION CLAUSES

A *most-favoured-nation* (MFN) clause in a sales contract provides the buyer with insurance protection against the contingency that the seller may offer a lower price to another customer. These clauses may prevent price discrimination when the seller offers a discounted price to another buyer, either in the future (a 'retroactive' MFN) or in the present (a 'contemporaneous' MFN). Although all MFNs change the seller's incentives in the same general way, the argument is clearer if

we illustrate some issues with the case of a retroactive MFN and others with a contemporaneous MFN.

(A) RETROACTIVE MFN

Consider an industry – for example, that produces large scale steam-turbine generators[14] – in which customers that are public utilities contract for the purchase of custom manufactured generators. Because delivery occurs many months after the contract is made, increased competition, reduced demand, or a reduction in costs during the intervening time period may reduce the average price paid by later buyers for comparable generators. By placing the following MFN clause in the sales agreement, early buyers may share that price decrease:

> If at any time before [buyer] takes delivery of said generator, [seller] offers a lower price for a generator of comparable size and quality to any other purchaser, [seller] will also offer that lower price to [buyer].

That is, any future price decreases must be rebated to the buyer.[15] This rebate mechanism effectively creates a penalty system similar to the one discussed in Section III and illustrated in Table 9.2. The MFN requires the seller to pay a monetary penalty if he reduces his price.[16] Because price decreases are penalised, they are discouraged. Thus, if all rivals provide all buyers with MFN protection, the co-operative outcome (p_H, p_H) can be stabilised, once it is achieved.[17]

Cooper (1981) has shown that following Schelling (1960), provision of an MFN *by even one rival* only may be advantageous to all sellers, including the one that institutes the MFN. This is a strong result, because a seller's unilateral adoption of an MFN also places it at a competitive disadvantage – it is deterred from matching selective discounts offered by its rivals. However, as demonstrated by Cooper, this competitive disadvantage may be more than offset by the effect of the clause in stabilising a higher price.

This outcome is illustrated in the Table 9.3 pay-off matrix below. Beginning from Table 9.1, this matrix adds the possibility of charging a third price p_M, where $p_L < p_M < p_H$. Relative to Table 9.1, it also assumes that one rival, Ethyl, offers an MFN which requires it to pay a penalty of 50 for any price decreases below an initial price, whether matched by DuPont or not. Since the penalty is paid only for price

decreases, the matrix is constructed contingent on these being a particular initial price pair. In Table 9.3, the assumed initial point is the asymmetric price pair (p_H, p_M).

We may illustrate the possibility of a credible equilibrium exising at the asymmetric price pair (p_H, p_M) as follows. DuPont has no incentive to raise its price to p_H. The penalty provision of the MFN eliminates Ethyl's incentive to lower its price to p_M or p_L. Assuming detection and retaliation can be carried out swiftly, DuPont has no incentive to lower its price to p_L; for if it does Ethyl will quickly respond by lowering its price to p_M. By contrast, without the MFN, (p_L, p_L) might be the equilibrium, because the short term gains from cutting price are relatively larger if the MFN is eliminated.[18] If the equilibrium is altered in this way, Ethyl's profits rise from 70 (without the MFN) to 80 (with the MFN), in spite of its induced competitive disadvantage. DuPont's profits rise from 70 to 130. These results illustrate Cooper's proof of existence.

TABLE 9.3 RETROACTIVE MFN

		DuPont					
		p_H	p_M	p_L	p_H	p_M	p_L
Ethyl	p_H	100	(80)	−10	100	(130)	140
	p_M	80	40	30	80	90	125
	p_L	90	75	20	−10	80	70
		Ethyl's pay-offs			DuPont's pay-offs		

(B) CONTEMPORANEOUS MFN

Most-favoured-nation clauses are also found in long-term requirements contracts governing the sale of repeatedly purchased industrial supplies. These clauses insure buyers against contemporaneous price discrimination in favour of other buyers.[19] Consider the following standard form:

> If [seller] should, during the term of this contract, offer or sell goods of equal quality and quantity to any other buyer at a price lower than that provided for herein, [buyer] shall receive the benefit of such lower price on all shipments made hereunder for which such lower price is effective.

This clause differs somewhat from the retroactive MFN. Whereas the retroactive MFN penalises all price reductions made at some date, this contemporaneous MFN penalises and deters only *selective discounts*, that is, price cuts that are restricted to a limited number of customers.[20] General price cuts are not penalised or deterred. Thus, selective discounts are made relatively less profitable than general price cuts. In that oligopoly competition takes the form of selective discounts, the MFN may serve to stabilise the co-operative outcome.

Since general price cuts are not penalised by a contemporaneous MFN, adjustments to a *co-operative* outcome at a lower price are not deterred if they become necessary.[21] Similarly, the ability to retaliate through a general price reduction against rivals' secret discounts is not constrained. Only selective discounts are penalised.

Gelman and Salop (1982) construct a formal model in which an oligopolist does not respond to the limited selective discounts initiated by his rival. Assuming that the existence of secret discounts is detected, but that the identity of the customers offered the discounts is not, then selective matching of secret discounts is clearly impossible. At the same time, retaliation through a general, matching price cut may not be in the oligopolist's own interests if the selective discounts were not offered widely.[22]

As this analysis shows, a contemporaneous MFN constrains the oligopolist's response in the same way as would its inability to identify the customers who were offered discounts. For example, suppose that DuPont offers a selective discount to a limited number of Ethyl's customers and suppose that Ethyl can identify these customers. However, suppose that due to the MFN, it is only feasible for Ethyl to respond with a general price cut to all its customers. In this case, Ethyl will compare the profit reduction from this customer loss to the alternative of offering a general price cut to all its customers, including those not approached by DuPont. The bigger is DuPont's discount and the fewer the customers that are approached by DuPont, the relatively more costly is a matching response by Ethyl. Hence, the more likely it is that Ethyl will accommodate the discounts rather than respond with a general price cut. In short, if DuPont restricts its secret discounting, it is more profitable for Ethyl to accommodate this rather than touch off a price war.

At the same time, the contemporaneous MFN also prevents Ethyl from offering its own selective discounts to DuPont's customers. Thus, if Ethyl has an MFN and DuPont does not, a credible equilibrium may exist at the point where Ethyl offers the high price (p_H) to

all its customers, and DuPont offers the price (p_H) to most customers and a discount price (p_L) to the rest. If both rivals offer an MFN, elimination of all selective discounting may stabilise the co-operative outcome (p_H, p_H).

An example of this analysis is provided in Table 9.4. Denoting a selective discount strategy as p_H/p_L, Table 9.4 is constructed by expanding the strategy space of Table 9.1 to include the possibility of a selective discount strategy (p_H/p_L) for either rival.[23] Of course, an MFN will prevent a firm from offering selective discounts.

TABLE 9.4 CONTEMPORANEOUS MFN

		DuPont					
		p_H	p_H/p_L	p_L	p_H	p_H/p_L	p_L
	p_H	100	80	−10	100	130	140
Ethyl	p_H/p_L	130	(85)	20	80	(85)	60
	p_L	140	60	70	−10	20	70
		Ethyl's pay-offs			DuPont's pay-offs		

Three cases must be considered: (i) No MFN; (ii) MFN by one rival only (e.g., Ethyl); and (iii) MFN by both rivals.

No MFN If neither rival is constrained by an MFN, the co-operative solution (p_H, p_H) represents a credible equilibrium only for sufficiently rapid rates of detection, as was discussed earlier. Because selective discounts are more difficult to detect than general price cuts, (p_H, p_H) may be immune only to general cuts – not to selective discounts. In this case it is usually argued that the selective discounting price pair (p_H/p_L, p_H/p_L) is more likely to represent the credible equilibrium than (p_H, p_H).[24] Assume that is the case here.

MFN by Ethyl only If Ethyl unilaterally institutes a contemporaneous MFN, it effectively commits itself to eliminate the strategy p_H/p_L. In this case, as was discussed earlier and illustrated in Table 9.4, it is not profitable for Ethyl to match DuPont's selective discounts with a general price cut to p_L.[25] Assuming that general discounts are deterred by rapid detection and retaliation, the outcome (p_H, p_H/p_L) is the credible equilibrium.[26]

MFN by both rivals If both rivals institute an MFN, only general discounts are feasible. As was discussed above, if rivals always match detected general price cuts but do not match detected selective

discounts, then, if detection is sufficiently rapid, neither rival will deviate from p_H. Thus, the co-operative outcome (p_H, p_H) may become a credible equilibrium.

This demonstrates how the adoption of an MFN can improve the likelihood of the co-operative outcome being a credible equilibrium. The mutual or unilateral adoption of most favoured nation clauses can be in the self-interest of the oligopolists.[27]

In spite of this anti-competitive effect, buyers may be willing to 'purchase' the 'protection' of an MFN for two reasons. First, insurance protection against price reductions may have value to risk-averse buyers. The MFN provides this insurance.[28] Of course, broad MFN protection reduces the probability that a lower price will ever materialise because it induces an adverse incentive (a 'moral hazard') for sellers who provide it. However, for any individual buyer, this effect may be small relative to the insurance benefit. Instead, the adverse incentive is mainly an 'external' effect that injures other buyers. The profit-maximising purchaser does not include this external effect in his calculus. Thus, the more buyers there are in the market, the more likely it is that the price stabilising effect will be ignored by buyers.[29]

In addition, a buyer who does add this potential injury to other buyers into his profit calculus may count that injury as a benefit, not as a cost. If rival buyers are also his downstream product market competitors, then his profitability is enhanced when his rivals' costs rise.[30] Looking at the problem in this way, a buyer may be willing to pay more for an MFN, because the MFN acts as a type of bribe to the seller aimed at inducing him to forego deeper discounts to rival buyers.

(C) PRICES POSTED, RELATIVE VALUE SCALES, AND PRODUCT STANDARDS

The provision of a most-favoured-nation clause would appear to require a long-term supply contract. However, this is unnecessary. In fact, a number of common pricing conventions have effects similar or even equivalent to those of an MFN.

Whenever a seller deals in a market in which all transactions are consummated at an identical (posted) price, the analysis of the MFN is applicable. Indeed, the making of transactions only at a single list price is the essence of an MFN.[31] The only difference is that an MFN is a binding contractual clause, whereas price posting (with no dis-

counts permitted) is normally adopted unilaterally and voluntarily.[32] One way a firm might effect a binding commitment without a contract is rapidly to make all of its transactions prices public. Then, those buyers who discover they have paid more than some other buyers may have a powerful tool for negotiating a matching discount.

A similar analysis can be applied to *relative value scales* and other multiproduct pricing formulæ. A relative value scale is a pricing system in which there is a fixed relationship among the prices of a number of products, which thereby restrict price movements to proportional changes in all prices. For example, a car repair shop might set an hourly rate and apply a standard job completion time table from a private or trade association publication (a 'flat rate manual').[33] In this case, the job completion times in the flat rate manual define the relative value scale. Insurers like Blue Cross sometimes use relative value scales for setting reimbursement levels for medical services.[34] Hay (1979) notes the similar effect of the 'price simplification' scheme used by GE and Westinghouse.

Product standardisation can also be analogised to an MFN. By setting the product attributes that define the standard, product standardisation eliminates some non-price competition: no seller can offer more or less of the standardised product attributes in an individual product. As a result, all competition must be in the price dimension. Given the large efficiency benefits of product standardisation, it is likely that the efficiency benefits will normally swamp any anti-competitive effects. However, *National Macaroni* suggests a possible anti-competitive use of product standardisation. This case concerned standardisation of a grain mix. Following a shortfall in the harvest of Durum wheat (semolina), the grain purchaser defendants agreed to fix the ratio of semolina and farina in macaroni. By preventing competition for the scarce supplies of the more expensive and preferred semolina variety, total costs could have been reduced at the expense of wheat farmers.[35]

V MEETING COMPETITION CLAUSES

A *meeting competition clause* (MCC) in a long term supply contract or advertisement provides the buyer with insurance protection against a lost opportunity in the contingency that the buyer is offered a lower price by some other seller.[36] The level of protection offered by an MCC depends on the exact form the provision takes. One

common variant is the *meet or release* (MOR) clause, as illustrated by the following example.[37]

> If the [buyer] should be offered by a responsible manufacturer anti-knock compound of equal quality and in a quantity equivalent to or less than that remaining as a commitment hereunder, at a lower delivered cost to the [buyer], and [buyer] gives [seller] satisfactory evidence thereof before the date on which any shipment is required, [seller] shall either supply such quantity of compound at the lower cost or permit [buyer] to purchase elsewhere. Any quantity so purchased shall be deducted from the quantity deliverable under this contract.

The meet or release clause serves mainly as an information exchange device. If the buyer discovers a lower price elsewhere, he cannot escape from his obligation to purchase from his original supplier without informing that supplier of the lower price.[38] By requiring this flow of information, the clause eliminates any detection lag. Thus, the seller is protected against the possibility of losing sales to a rival offering an undetected discount to a current customer. In this way, an MOR facilitates the selective matching of otherwise secret discounts. Assuming that the seller wishes to match the discount, the rival's strategy is countered. As a result, the joint profit outcome is made relatively more credible.

(A) NO-RELEASE MCC

It is unlikely that a seller would choose to *meet* rather than *release* in all cases. For example, if a rival offers a price below the seller's marginal cost, the seller has no direct incentive to match.[39] Likewise, the seller has no incentive to match a discount which he suspects the buyer will reject. For example, if the rival's product is of lower quality or otherwise unsuitable, the buyer might be suspected of using the lower bid simply as a bluff in order to obtain a better deal.[40]

In these cases, an MOR clause offers no protection to the buyer. The buyer prefers, *ceteris paribus*, a contractual provision that allows the seller no escape. This can be accomplished by deleting the *release* language from the provision. Of course, such a *no-release* MCC may lead to allocative inefficiencies.[41] However, if the seller's primary interest is in deterring rivals' discounts, the losses entailed by this inefficiency may be small relative to the anti-competitive benefit of

the clause. For, by deleting the *release* option, the clause is made a more credible deterrent. Now, the seller must meet all rivals' offers.

Formally, in the 2×2 example, the co-operative outcome is stabilised as follows. If both rivals provide *no-release* MCCs the off-diagonal price pairs (p_L, p_H) and (p_H, p_L) are made unattainable. Given the remaining choice between the two diagonal price pairs (p_H, p_H) and (p_L, p_L), neither oligopolist wishes to deviate from the joint profit outcome.

An MCC also facilitates the successful achievement of the co-operative outcome. For example, a seller who provides a *no-release* MCC to current customers can raise price to p_H without losing any sales to a lower priced rival. Buyers are automatically given the rival's lower price until all firms raise their prices. This eliminates the transitional losses that might otherwise deter price rises. It also eliminates the rival's transitional gains and with it the incentive to delay a matching price increase. In this sense, when a duopoly seller who has an MCC raises his price to p_H, his rival is automatically transformed into a *de facto* price leader, with the ability to set prices for both firms.[42]

(B) MCC PLUS MFN

When a *no-release* MCC is provided jointly with an MFN,[43] oligopoly co-ordination is further facilitated. As was discussed in Section IV(B), the unilateral provision of a contemporaneous MFN places the provider at a competitive disadvantage against rivals not burdened with the clause. This is because the MFN prevents him from selectively matching discounts that are detected. The joint provision of a *no-release* MCC together with the MFN counters this disadvantage somewhat.

By *requiring* himself to match, the seller eliminates the source of his disadvantageous incentive to accommodate selective discounts. This incentive is disadvantageous because it raises the profitability and, hence, the likelihood that his rival will offer such selective discounts. Of course, if the rival is not deterred by the MCC, his discount must be matched with a general price cut, and the seller bears a larger loss.[44] On the other hand, because of the credibility added by the clause, the need actually to carry out the threat may be reduced.

A complex variant of these contractual provisions is a *marketwide* MFN–MCC combination. The following example of such a combination clause is taken from a contract governing the sale of natural

gas from a particular field. Unlike the previous contracts discussed, this particular clause offers MFN–MCC 'protection' to the (natural gas) *seller* rather than to the buyer.

> In the event [buyer] or any other gas purchaser shall pay for any gas delivered . . . under conditions comparable to those provided herein, a price higher than that provided here, to any seller, then the price of all gas delivered hereunder shall be increased to an equivalent price. [Buyer] shall have the right to require under the provisions of this paragraph reasonable proof of the delivery of gas to any other gas purchaser and the price thereof.[45]

Analysis of this clause is left as an exercise for the interested reader.

VI PREDATION, ENTRY DETERRENCE AND MEETING COMPETITION CLAUSES

The focus of the analysis so far has been oligopoly co-ordination. It has been assumed throughout that the industry is protected by insurmountable barriers to entry. In this section, we discuss the role of 'meeting competition' clauses in facilitating deterrence to entry.[46]

Recall the usual critique of the Bain/Sylos-Labini models of limit pricing as a rational deterrent to entry. It is argued that it would be irrational for an incumbent and dominant firm to deter entry by *setting* a low 'limit' price before entry occurs. Instead, the incumbent could increase his profits by setting the higher 'monopoly' price before entry and *threatening* to reduce its price in the event that entry actually occurred. Given the threat, it is argued, no actual entry would occur, because the entrant would anticipate earning insufficient profit at the lower post-entry price. Hence, the incumbent could always get the benefit of charging the monopoly price even while deterring entry.[47]

This argument is usually countered in turn by the observation that the incumbent's threat actually to lower the price after entry lacks credibility. Once entry actually occurs, it is generally in the incumbent's interest to accommodate the entrant by behaving co-operatively.[48] Knowing this, a rational entrant would not be deterred. A similar argument demonstrates the lack of credibility in threats to carry out below-cost 'predatory' pricing.

By providing a *no-release* MCC, an incumbent can add needed

credibility to its threat. Even if the incumbent would otherwise prefer to accommodate a rational entrant, the MCC requires him to match the entrant's price.[49] Similarly, even if below-cost pricing is unprofitable, it must be carried out. Knowing that the threat will be carried out, a rational entrant will be deterred. Although the appropriate language of the MCC depends on the details of the industry,[50] the benefit of the MCC to the incumbent is clear. An MCC can deter entry by allowing the incumbent to make credible threats to lower his price in the event of entry, even to a below-cost, 'predatory' level. As Richard Gilbert emphasised during the conference reported on in this volume, the MCC makes Sylos' Postulate credible.

VII CONCLUSIONS

In this chapter, the role of buyer–seller contracts in facilitating credible oligopoly co-ordination has been explored. It has been shown that a number of common contractual provisions can restructure oligopolists' pay-off matrices in such a way that the Nash equilibrium is altered. This may occur for either simple Nash or credible dynamic equilibria.

This brief survey is not a definitive treatment of the area. All the practices would benefit from additional rigorous analysis in standard oligopoly models. However, it seems clear that the main results can be generalised. When contractual provisions add constraints to oligopolists' profit-maximisation calculus, the equilibrium changes.

Some experimental evidence on this point has recently been generated by Grether and Plott (1981).[51] These authors compare the pricing performance of an industry with MFNs, public price posting, and advance notice of price increases with that of the same (experimental) industry but without these practices. Their results confirm that if the three practices are applied in combination prices are raised significantly.[52]

Although this survey has shown how these contractual provisions can raise prices in oligopolistic markets protected by entry barriers, it has clearly not attempted a welfare analysis of the practices. Such an analysis must balance the benefits received by buyers and sellers against any anti-competitive effects of the contractual provisions. Some of the possible benefits have already been discussed in the context of the analysis of specific practices. It is worth reviewing them here.

First, both MFN and MCC clauses provide buyers with insurance

against certain contingencies. Risk-averse buyers desire insurance protection. There are significant limitations to the size of this benefit, however. First, a buyer may overestimate the value of this insurance if he ignores the price rigidity that may be induced by the clauses. Similarly, a buyer will be likely to ignore the externality he inflicts on other buyers, that is, the effect of its clause on the price paid by other buyers. As stated earlier, inserting an MFN into one buyer's contract is tantamount to bribing the seller to refuse to offer larger discounts to other buyers.

Although buyers may benefit from insurance, it is not clear that the seller is always best situated to provide this insurance, as opposed to an independent insurance company or some other third party. First, the seller may be more risk-averse than either buyers or insurance companies. Second, a seller is not generally well situated to spread the risk of a decrease in his own selling price, relative to some other firm unaffected by the price change. On the other hand, the seller probably has an informational advantage in providing this insurance. Even if the seller did not provide insurance, he would require information about future prices in order to plan his business.[53]

A second possible benefit of the clauses is that they allow a buyer to purchase before completing his search process. Eliminating this delay can benefit both the buyer and the seller offering the clause. Third, the MCC allows the seller to indulge in price discrimination whereas the MFN prevents discrimination.[54] Thus, industry-wide adoption of either type of clause can benefit some buyers and harm others.[55]

It should be clear that these benefits may be more likely in some industry settings than in others. According to the characteristics of the product sold, the terms of the sales contract, the degree of industry concentration, the height of entry barriers, the structure of competition among buyers, etc. the relative sizes of the efficiency and facilitation of co-ordination effects of particular clauses may tip the welfare balance in one direction or the other. More research is needed on this issue. For now, anti-trust analysis of these clauses must clearly proceed on a case-by-case basis.

NOTES

1. This work reflects the research and litigation skills of a number of my former FTC colleagues with whom I worked on the *Ethyl* case: Robert Burka, Paul Pautler, Margaret Sladé and David Scheffman. I have also

benefited from the comments of Bill Dudley, Richard Gilbert, Charles Holt, Jack Kirkwood, Warren Schwartz, Joe Simons, and my discussant, Thomas v. Ungern-Sternberg. Many of the ideas considered here have come out of joint work with Judith Gelman and are discussed more formally in Gelman and Salop (1983). Financial support for this research has been provided by the Bureau of Economics of the Federal Trade Commission.

2. Although the rivals' names are taken from the FTC's recent *Ethyl* (1981) case, the facts assumed in these examples do not correspond exactly to those in the case. For example, the real-life domestic lead-based anti-knock compound industry also includes two fringe firms, PPG and Nalco. In addition, costs may have been different while rivals' products were considered homogeneous by purchasers. Obviously, real life is far richer and more complex than theory. See Grether and Plott (1981) and Carlton (1983) for other economic analyses of *Ethyl*.
3. Formally, assume that the demands for Ethyl (E) and Dupont (D) satisfy the symmetry condition $X^{E}(p, q) = X^{D}(q, p)$ for all price pairs (p, q) for the two rivals.
4. It has been argued by the economist-lawyer Donald Turner (1962) that sophisticated oligopolists will easily overcome this problem. Each will recognise his mutual interdependence with his rivals, his long-run interest in raising price quickly, and his rivals' likely identical view. However, this position may underestimate the divergence of firms' interests during the transition period. This issue is taken up in more detail below in the discussion of the maintenance of the joint profit point. For a law review answer to Turner's arguments, see the interesting article by the lawyer-economist Richard Posner (1969).
5. Richard Posner (1969) has pointed out that the easier it is to achieve (and reachieve) the co-operative outcome, the greater is the incentive to deviate from that outcome in order to obtain higher short run profits. That is, $1-b$ might be small because (p_H, p_H) can be quickly reattained. Thus, ease of achieving co-operation increases the incentive to cheat. Green and Porter (1984) and Porter (1983) explore this issue by analysing how a cartel will determine the optimal punishment period.
6. In the Green and Porter (1984) model, this issue is more complicated because cheating is not determined with certainty.
7. See Gelman and Salop (1982) and d'Aspremont *et al.* (1982) models with this property.
8. For the purposes of analysing the economic effects of these practices on strategic interaction, it makes no difference whether or not the oligopolists adopt the practices in the belief that they will stabilise the co-operative outcome. Of course, the intent may be an issue in a legal challenge to a practice.
9. Reaching an agreement can also be facilitated by the exchange of information among rivals.
10. In terms of equation (1), information exchanges directly alter b whereas incentive management devices alter the pay-offs V_{ij} which in turn alter b.
11. Each of the prices can denote vectors of prices and/or other strategy variables, of course.

12. This point is also made by Posner (1979 at p. 1198.)
13. Of course, a buyer would clearly be willing to accept the clause for a compensatory payment in excess of his loss $p_H - p_L$, for each unit purchased. However, compensation at this high level eliminates any benefit to the oligopolist.
14. The Justice Department alleged that GE and Westinghouse had MFN clauses that facilitated tacit co-ordination. See the *General Electric Competitive Impact Statement* (1977) and Hay (1979).
15. Variants of this contract could provide for a rebate even of price cuts made even after delivery was taken, or for a partial rather than a full rebate. The contract might also ease enforcement of the clause by providing the buyer with the right to inspect the seller's books.
16. The total penalty equals the price decrease times the number of outstanding orders. It is paid even if the discount is matched.
17. Of course, the MFN makes it more difficult to achieve a lower price co-operative outcome, if changed conditions warrant a lower price. This is a cost to the oligopolists of adopting such a plan. In contrast, the Table 9.2 penalty scheme does not share this problem because only *unmatched* price cuts are penalised.
18. This can be seen as follows. Given the MFN, if DuPont lowers its price from p_M to p_L, it will obtain a short-run gain of 10 (i.e., 140–130) and suffer a long-run loss of 5 (i.e., 130–125) when Ethyl retaliates by cutting its price to p_M. In contrast, without the MFN, beginning at (p_H, p_H), DuPont gains 30 (i.e. 130–100) from a cut to p_M and loses 10 (100–90) from a matching cut by Ethyl. In this case, DuPont's short-run gain rises by more than its long-run loss rises. Similarly, beginning at (p_M, p_M), a DuPont cut from p_M to p_L gives a short-run gain of 35 (i.e., 125–90) and a long-run loss of 20 (i.e., 90–70) when Ethyl matches. Again, the gain rises by more than the loss. See Cooper (1981) for a more general model.
19. These other buyers may be downstream competitors as well.
20. It should be noted that buyers who are well informed about the prices paid by other buyers may induce a *de facto*, if not explicit, MFN policy. See the discussion of posted prices in Section VI, C below.
21. If costs fall, for example, then the joint profit-maximising price may decline.
22. In addition, as discussed earlier, it may be unprofitable to match discounts to marginal customers. The following analysis applies to this case as well.
23. Note that Table 9.4 is constructed with the property that if your rival offers selective discounts, then selective discounts are more profitable than offering a low price to all customers, even if this low price is not matched (i.e., $85 > 60$). This assumption is necessary to make selective discounting a simple Nash equilibrium.
24. See Gelman and Salop (1983) and for d'Aspremont *et al.* (1982) for technical analyses of this point.
25. If DuPont offers selective discounts, Ethyl's profits fall to 80. However, if it retaliates with a general price cut to p_L, its profits fall further to 60.
26. Of course, in a model with a continuous strategy space, the level of the

high and low prices may also change, relative to the case of no MFN.

27. As was discussed in the case of a retroactive MFN, unilateral adoption of a contemporaneous MFN may be in each rival's self-interest even if the clause is not also adopted by rivals. This benefit to a firm from the unilateral adoption of an MFN is independent of any increased efficiency or buyer preference for the MFN. Instead, it derives from its effect of stabilising a more co-operative outcome. Of course, on the other side, *unilaterally* adopting a MFN gives a competitive advantage to rivals.
28. Even without increased oligopolistic competition, prices could also fall if costs or aggregate demand decrease, if barriers to entry were reduced, etc.
29. The possibility that the buyers' cost-minimising outcome of 'no MFN' will be achieved for a market characterised by an oligopsony among buyers depends on an analysis analogous to the one carried out here for oligopolistic sellers.
30. Indeed, if the downstream industry demand is sufficiently inelastic and barriers to entry are sufficiently high, then the buyer's (and his rivals') profits will increase from MFN-induced, *industrywide* increases in input prices. See Nelson (1957), Salop and Scheffman (1981) and Maloney and McCormick (1981) for models of this phenomenon.
31. The analysis of 'secondary' line violations of the Robinson–Patman is analogous.
32. Of course, the efficiency benefits of posted prices may also differ from those of a standard MFN.
33. Of course, the car repair industry probably has too few entry barriers to make a relative value scale able to effectively raise prices for very long.
34. See Kass and Pautler (1979), Eisenberg (1980) and *Arizona* v. *Maricopa County Medical Society* (1982).
35. The Court did not carefully compare efficiency benefits with the postulated anticompetitive effects.
36. Although our analysis focuses on the case of an MCC in a long term contract, much of this analysis applies directly to the case of binding 'We will not be undersold' advertising claims as well.
37. MOR clauses were offered by all of the *Ethyl* defendants but were not included in the Complaint. They have been litigated in other contexts, however. For example, see Peterman's (1979) analysis of the *International Salt* case.
38. Unless the supply contract includes an *exclusive dealing* provision, the buyer can purchase *extra* supplies at the lower price without informing his original supplier.
39. Of course, by requiring the seller to price below marginal cost, an MCC can increase the credibility of threats to become predatory. This is taken up in Section VI below.
40. By an analogous argument, it would not be sufficient to simply *meet* the price of a higher quality product. Instead, the seller would need a *beating competition* clause.
41. The clause may require the seller to provide units at prices below his marginal costs. Thus, the buyer may be consuming beyond the point where his marginal benefit equals the seller's marginal cost.
42. This price leadership is restricted to prices no greater than p_H, of course.

43. The following analysis applies to industries where an effective MFN is entailed by posted prices as well as by contracts that specify MFN protection explicitly.
44. For example, the rival may wish to cut price because of a reduction, in order to generate greater demand by current and new customers, rather than to divert customers from competitors.
45. Adapted from *Louisiana-Nevada Transit Co.* v. *Woods*, 393 F. Supp. 177, 178–9 (W.D. Pa. 1975).
46. See Modigliani (1958), Salop (1979) and Dixit (1982) for surveys of this literature.
47. By assuming that the incumbent can rapidly lower his price after entry, this argument obviously assumes that the incumbent is not paralysed by regulation, not unaware of entrants' existence, or otherwise catatonic.
48. Of course, this counter-argument implicitly assumes that tacit co-ordination will be successful. This may not be obvious, as shown earlier.
49. An MCC merely requires that matching price cuts should be given to the incumbent's current customers. An MFN–MCC combination would extend the discount to all potential customers.
50. For example if, at equal prices, some consumers strictly prefer the entrant's product the incumbent can strengthen his threat by offering a *beat or release* or *beating competition* clause instead. A beating competition clause might offer an x per cent discount off competing bids. Of course, this could lead to 'self-predation' if a more efficient entrant threatens entry.
51. For a survey of some earlier experimental work, see Plott (1981).
52. Given the limited number of experiments run, their preliminary study was unable to measure significantly the individual effects of each practice.
53. Of course, one aspect of the seller's informational advantage – the fact that it controls somewhat the probability of a price cut – is the very adverse incentive ('moral hazard') induced by the clauses, not an efficiency benefit.
54. See Salop (1977) and Weismeth (1982) for analyses of price discrimination based on informational differences.
55. It should be added that the elimination of buyers' price competition for *inputs* entailed by adoption of an MFN, may harm final consumers.

REFERENCES

d'Aspremont, C., Jacquemin, A., Gabszewicz, J. J. and Weymark, J. (1982) 'On the Stability of Dominant Cartels', *Canadian Journal of Economics*, vol. 14, pp. 17–25.

Carlton, D. (1983) 'A Re-examination of Basing Point Pricing', *Journal of Law and Economics*, vol. 26, pp. 51–70.

Cooper, T. E. (1981) 'Price Protection Policies and Tacit Collusion', unpublished manuscript, University of Florida.

Dixit, A. K. (1982) 'Recent Developments in Oligopoly Theory', *American Economic Review*, vol. 72, pp. 12–17.

Eisenberg, B. S. (1980) 'Information Exchange Among Competitors: the

Issue of Relative Value Scales For Physicians' Services', *Journal of Law & Economics*, vol. 23, pp. 441–60.
Gelman, J. R. and Salop, S. C. (1983) 'Judo Economics: Capacity Limitation and Coupon Competition', *Bell Journal*, vol. 14, pp. 315–25.
Green, E. J. and Porter, R. H. (1984) 'Noncooperative Collusion Under Imperfect Price Information', *Econometrica*, vol. 52.
Grether, D. M. and Plott, C. R. (1981) 'The Effect of Market Practices in Oligopolistic Markets: an Experimental Examination of the Ethyl Case', unpublished manuscript, California Institute of Technology.
Hay, G. A. (1979) 'The Oligopoly Problem: Theory and Policy', unpublished manuscript, Cornell University.
Kass, D. I. and Pautler, P. A. (1979) *Physician Control of Blue Cross Plans*, Federal Trade Commission, USA.
Maloney, M.T. and McCormick, R. E., 'A Positive Theory of Environmental Quality Regulation', *Journal of Law & Economics*, vol. 25, pp. 99–124.
Modigliani, F. (1958) 'New Developments on the Oligopoly Front', *Journal of Political Economy*, vol. 66, pp. 215–32.
Nelson, R. (1957) 'Increased Rents from Increased Costs: a Paradox of Value Theory', *Journal of Political Economy*, vol. 65, pp. 387–93.
Orr, D. and MacAvoy, P. (1965) 'Price Strategies to Promote Cartel Stability', *Economica*, vol. 44, pp. 185–97.
Osborne, D. K. (1976) 'Cartel Problems', *American Economic Review*, vol. 66, pp. 835–44.
Peterman, J. L. (1979) 'The International Salt Case', *Journal of Law & Economics*, vol. 22, pp. 351–64.
Plott, C. R. (1981) 'Theories of Industrial Organization as Explanations of Experimental Market Behavior', in S. C. Salop *et al.*, *Strategy, Predation, and Antitrust Analysis*, (Washington D. C.: Federal Trade Commission).
Porter, R. (1983) 'Optimal Cartel Trigger Price Strategies', *Journal of Economic Theory*, vol. 29, pp. 313–38.
Posner, R. A. (1969) 'Oligopoly and the Antitrust Laws: a Suggested Approach', *Stanford Law Review* vol. 21, pp. 1562–1606.
Posner, R. A. (1979) 'Information and Antitrust: Reflections on the *Gypsum* and *Engineers* Decisions', *Georgetown Law Journal*, vol. 67, pp. 1187–1203.
Salop, S.C. (1977) 'The Noisy Monopolist: Imperfect Information, Price Dispersion and Price Discrimination', *Review of Economic Studies*, vol. 44, pp. 393–406.
Salop, S. C. (1979) 'Strategic Entry Deterrence', *American Economic Review*, vol. 69, pp. 335–8.
Salop, S. C. and Scheffman, D. T. (1981) 'Strategic Interaction in Multiple Markets', unpublished paper, Federal Trade Commission.
Schelling, T. C. (1960) *The Strategy of Conflict* (Cambridge, Mass.: Harvard University Press).
Scherer, F. M. (1980) *Industrial Market Structure and Economic Performance* (2nd Edn) (Chicago: Chicago University Press), pp. 160–64.
Stigler, G. J. (1968) 'A Theory of Oligopoly', reprinted in Stigler, *The Organisation of Industry* (Homewood, Illinois), pp. 39–66.
Turner, D. F. (1962) 'The Definition of Agreement Under the Sherman Act: Conscious Parallelism and Refusals to Deal', *Harvard Law Review*, vol. 75, pp. 655–706.

Wiesmeth, H. (1982) 'Price Discrimination Based on Imperfect Information: Necessary and Sufficient Conditions', *Review of Economic Studies*, vol. 49, pp. 391–402.

CASES CITED

Arizona v. *Maricopa County Medical Society*, No. 80-419, U.S. Sup. Ct., 18/6/82.
International Salt Co. v. *United States*, 332 U.S. 392 (1947).
In re Ethyl Corp., No. 9128 (FTC Initial Decision 5 Aug. 1981) 729 F.2d 128 (2d. Cir. 1984).
Louisiana-Nevada Transit Co. v. *Woods*, 393 F. Supp. 177 (W.D. Pa. 1975).
National Macaroni Mfrs Assn v. *FTC*, 345 F. 2d 421 (7th Cir. 1965).
United States v. *General Electric Co.*, Competitive Impact Statement, 42 *Fed. Reg.* 17003 (30 March 1977) (consent decree).

Discussion of the Paper by Steve C. Salop

Von Ungern-Sternberg argued that Salop's paper constituted a set of examples that could not be easily generalised. To demonstrate this point, he provided a set of counter-examples to Salop's arguments. To begin with, he attacked the argument that an agreement to provide low prices to customers who had purchased earlier at high prices would facilitate oligopoly co-ordination. He agreed that such an action would increase the cost of cutting price, since the price cut would have to be extended to some previous buyers through rebates. But he argued that this implied that the demand for a firm with a reputation as a price cutter would rise at every price, just because of the possibility of rebates. This made price cutting more attractive. It was not clear which of these two effects would dominate.

Next, Ungern argued that agreements to extend price cuts made to other buyers by issuing rebates would not be a common practice. Again, he agreed that in a duopoly it was possible that one of the sellers could make himself better off by unilaterally offering a rebate clause. But he pointed out that in such a situation, being a first mover was disadvantageous, so that both sellers would likely wait around for the other to extend the rebate clause first.

Finally, he argued that meeting competition clauses would not work against new entrants. In the absence of strong entry barriers, monopoly would not be stable. Rebate clauses might have perfectly legitimate efficiency enhancing purposes. The net consequence of these considerations was that it was very difficult to use the results of the paper as a guide to policy.

Salop agreed that it was always important to examine each case on its own merits to determine whether the kind of arguments suggested by Ungern might be correct and whether legitimate efficiency arguments could be used to defend the practices. Salop added that when firms compete with prices, facilitating practices would always be attractive. To demonstrate this, he offered an argument that was illustrated in Figure 4.9.1, drawn from a paper by Thomas Cooper.

The figure corresponded to a model where firms made Nash conjectures, but competed in prices. The horizontal axis measured the price charged by firm 1 while the vertical axis gave the price charged by firm 2. Suppose that R_1 was the reaction curve of firm 1 and R_2 was the reaction curve of firm 2. By the definition of the reaction curve, firm 2's iso-profit curve must be vertical at the Nash equilibrium, while firm 1's iso-profit curve must be horizontal. Hence there must be a set of prices where both firms were better off. If firm

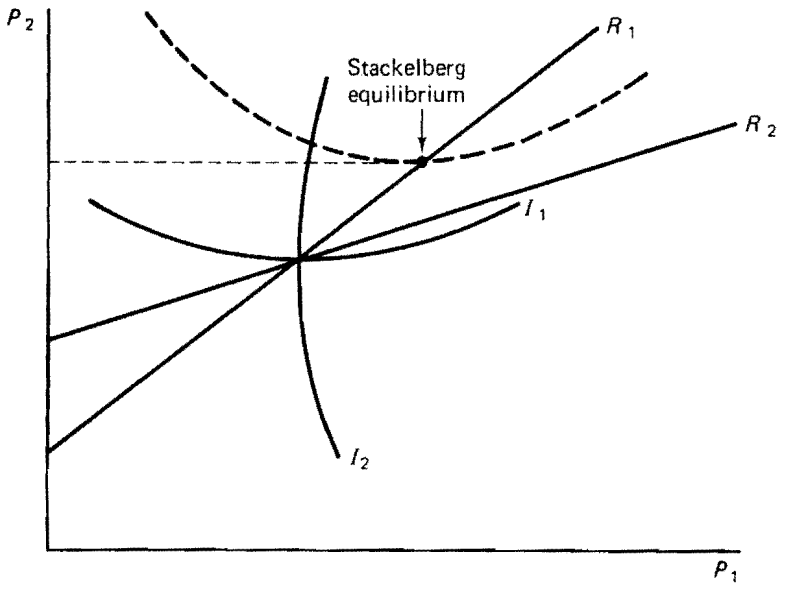

FIG. A.9.1

2 committed itself to a price slightly above the Nash equilibrium price, firm 1 would respond by moving to its reaction curve, and both sellers would be better off. This was in sharp contrast to the Cournot quantity-setting game, where the follower was worse off than he would have been in a Nash equilibrium.

Commitment to a price above the Nash equilibrium price could be brought about by using a 'most-favoured nation' clause, where the firm promised to extend future price cuts to current buyers. This promise made price cutting costly and made firm 2's commitment credible. It was easy to convince oneself that it was possible to construct examples where each player would prefer to be a follower in the price-setting game. Salop agreed that this might make each participant reluctant to move first, as had been suggested by Ungern. Alternatively, one firm might be willing to sacrifice the advantage for a certain smaller gain. This problem might also be overcome by adding a generalised 'meet-the-competition' clause. Firm 2 might commit itself to the desired price, then promise to respond along its reaction curve to any price offer by firm 1. This kind of clause would effectively turn firm 1 into the leader, to firm 2's benefit.

Ungern added that 'meet-the-competition' clauses could give rise to additional demand modelling problems. He suggested that the firm offering the lowest price in the market should get the lion's share of demand, even if all other firms have 'meet-the-competition' clauses.

He commended Salop's use of lexicographic buyer preferences as a potential way of modelling this.

Michael Katz suggested that 'meet the competition' clauses might be difficult to enforce if it were costly for buyers to search out the lowest price available in the market. Salop agreed that this was so but that firms offering the clauses might supply the information themselves to buyers to lower the enforcement costs. Salop referred to Texas International Airlines who, in addition to offering a 'meet-the-competition' clause, also promised to supply a toll-free number for consumers to call. This number would provide the lowest price in every market.

Curtis Eaton, suggested that problems associated with deterring entry and enforcing 'meet-the-competition' clauses required that these issues be modelled in an explicit temporal framework. It was well known that neither entry deterrence, nor contract enforcement would arise in finitely repeated games since recursive arguments suggested that if it were profitable to violate contracts in the last period of the game, it would *always* be profitable to violate them. Eaton suggested that these difficulties might lead consumers and potential entrants to discount such clauses.

In response to a question by *Spence*, Salop explained that certain contractual arrangements might allow firms to overcome the usual informational problems that led to cartel instability. In the Stigler model of cartel stability, for example, the benefit to a deviant firm was the extra profit that it earned before its competitors retaliate. The amount of profit then depended on the time it took other members of the cartel to detect price cuts. Cartels would tend to be stable when this detection lag was short. A 'meet or release' clause in a contract would tend to reduce the detection lag, since it created an incentive for buyers to report sellers who offered price cuts. This shifted the costs of detection from sellers to buyers. *Reinhard Selten* suggested that sellers might be able to neutralise 'meet or release' clauses by disguising price cuts. For example, they could pay buyers rebates at the end of the year that were not related specifically to any single transaction that occurred during the year. Salop responded that the same sort of phenomena occurred when sellers, like car dealers, refused to make price offers in writing. The odd implication of this was that sellers only made a firm price offer once the buyer agreed to purchase the product.

To illustrate further the informational issues associated with facilitating practices, Salop referred to competition between the Giant and

Safeway Supermarket chains in Washington DC. Giant had started to publish a price index which gave the relative cost of buying a common basket of groceries at Giant and Safeway. Salop explained that to make this index into a 'meet-the-competition' clause, Giant could have promised to pay a rebate to buyers based on the differences in these published indices.

Willig pointed out that facilitating practices were defined as conduct that have the effect of altering the pay-off matrix associated with the price game played by sellers. He felt that this definition of facilitating practices was not specific enough for an analyst to conclude that any practice by a firm was necessarily facilitating by looking only at the changes in the pay-off matrix in response to the practice. Salop responded that, broadly speaking, a practice was facilitating if it raised the Nash equilibrium price in the sellers' game without providing an offsetting benefit to consumers such as higher quality.

Schmalensee and *Waverman* suggested that it was usually possible to find an efficiency rationale for facilitating practices. The concept in and of itself, added Schmalensee, would not make anti-trust practices any easier, since it did not determine the *net* benefits associated with any of these facilitating practices.

Gilbert suggested that with entry, it would be difficult for any facilitating practice to raise the industry price much above the Bain limit price without some inertia on the part of the buyers of the products of incumbent firms. *Grossman* added that if buyers moved to the lowest-price seller, simultaneous 'meet-the-competition' clauses, offered by both the incumbent and the entrant, would lead to Bertrand equilibrium.

Larry White suggested that facilitating practices illustrated two well-known paradoxes in industrial organisation. First, in competitive markets, more information made competition work better whereas in non-competitive situations, more information might facilitate collusion and make things worse. Second, long-term arrangements, to the extent they provided insurance, are beneficial, but with imperfect competition long-term contracts, might, again, facilitate collusion.