Countervailing Power and Price Transparency

by

Morten Hviid and H. Peter Møllgaard

CCR Working Paper CCR 01-2
February 2001

Abstract

We investigate whether increased transparency about prices may increase the countervailing power exercised by buyers of an intermediate good and whether this will lead to a decrease of intermediate goods prices. We show that, even in a non-cooperative, one-shot model, improved transparency does not create an unambiguous downwards trend in prices. While prices in poorly informed markets may fall, prices in well informed markets will increase because informed firms will recognise that their price setting due to the transparency policy will influence outcomes in other markets. Welfare effects are hence ambiguous and depend on the weight placed on uninformed markets.

Keywords: Negotiated intermediate prices, countervailing power, price transparency.

JEL: L20, L40

Morten Hviid
School of Economic and Social Studies,
University of East Anglia,
Norwich NR4 7TJ
m.hviid@uea.ac.uk

ISSN 1473-8473

Countervailing Power and Price Transparency*

Morten Hviid†
University of East Anglia

H. Peter Møllgaard‡
Copenhagen Business School

February 2001

*The authors would like to thank Morten Bennedsen, Keith Cowling, Amrita Dhillon, Paul Dobson, Arvid Nilsson, Per Baltzer Overgaard, Carlo Perroni, Kim Scharf, Christian Schultz, Greg Shaffer, Birgitte Sloth, Tomasso Valetti, Michael Waterson and participants in the CIE workshop, Tune, at the 26th EARIE conference, Turin, 1999, at the RES 2000 conference St. Andrews, 2000, at the CIE/CBS workshop on 'Modelling Market Transparency' as well as participants in departmental seminars at the Copenhagen Business School and at the Universities of East Anglia and Warwick for helpful comments and suggestions. The usual disclaimer applies.

†School of Economic and Social Studies, University of East Anglia, Norwich NR4 7TJ and Centre for Competition and Regulation, University of East Anglia. e-mail: m.hviid@uea.ac.uk

‡Department of Economics, Copenhagen Business School, Solbjerg Plads 3, C5, DK-2000 Frederiksberg and Centre for Industrial Economics, University of Copenhagen. e-mail: hpm.eco@cbs.dk

... oligopoly facilitates the exercise of countervailing power by enabling the strong buyer to play one seller off against another. Galbraith (1956, 113)

1 Introduction

Transparency regarding prices is often thought of as a means of improving competition and efficiency. In the UK, the Competition Commission in its recent inquiry of supermarkets stated that the first solution to problems of pricing behaviour would be to increase transparency of pricing. This could be done by improving price information on supermarket shelves and by making price comparisons easier through compulsory publishing of all current retail prices of different supermarkets on the internet.[1] The previous Danish competition act also relied heavily on market transparency as its main instrument to obtain more competition[2] and the Danish government in a recent report re-iterated its view that improved market information would often be a more powerful instrument than many of the Competition Authority's concrete interventions.[3] The roots of transparency in competition policy may be traced back to the 1930 London Resolution of the Interparliamentary Union: The Resolution was favourable to cartels and dominant firms, considering these natural economic phenomena that could be controlled using publication of data regarding structure, conduct and performance.

Transparency means that market participants should have as much information about the market as possible, preferably all information. This may make sense in search markets where customers have imperfect information about prices and there is a significant search cost: a recent Danish investigation was concerned with *undertakers'* pricing of coffins where presumably the emotional cost of searching is high.[4] Search markets are unconcentrated markets which makes the acquisition of information by individuals costly.

However, the Danish Competition Authority has also made public firm specific information about prices and discounts in much more concentrated markets where search costs are negligible. Recent examples include the market for ready-mixed concrete; the three largest whole-sellers of plumbing supplies for heating and sanitary purposes; producers of flat glass

[1] See http://www.competition-commission.gov.uk/10-00rem.htm
[2] See Albæk, Møllgaard and Overgaard (1996, 1998) for an overview and discussion.
[3] Danish Ministry of Trade and Industry (1999).
[4] See Competition Council (1994a).

and double-glazed windows; and the three largest whole-sellers of electricians' supplies.[5] Note that in these cases, intermediate goods prices are negotiated rather than set by the upstream firm, be they producers or whole-sellers. In the plumbing case, for example, it was the "individually negotiated discounts and bonuses" that were published.

In these concentrated markets improved information regarding sellers' prices, quantities or market shares *may* lead to improved coordination of sellers' strategies leading to higher prices as pointed out by Stigler (1964) and many authors since. That this is more than a theoretical possibility is demonstrated empirically by Albæk, Møllgaard and Overgaard (1997) on price data from the oligopolistic Danish ready-mixed concrete industry.

On the other hand, improved information among buyers about different prices at different sellers might lead them to shop around for better deals or to take tougher stands in negotiations about prices. This countervailing power[6] would lower the price that the individual buyer obtains in the market place. This was undoubtedly one of the motivations for the emphasis on transparency in the previous Danish competition act and it may be the reason why consumer protection organizations insist on transparency. Advocates of transparency in competition policy are loath to accept that such publication could lead to the improved oligopolistic coordination and thus the substantial price increases of e.g. ready-mixed concrete that Albæk, Møllgaard, and Overgaard (1997) found. Instead they tend to emphasize the increased countervailing power brought about by increased transparency.

The aim of this paper is to establish whether, and if so, when, the transparency policy of improving buyers' information leads to lower prices and increased welfare in concentrated markets in a static setting. We thus explicitly do not consider the scope for improved seller coordination that the increase in transparency could also trigger[7] but restrict ourselves to investigating the effect of improved transparency on negotiations of contracts in vertical transactions of e.g. ready-mixed concrete, plumbing widgets, glass or electricians' supplies.

[5] For details on these cases, consult Danish Competition Council (1994b;1995a,b;1996a,b).

[6] See Dobson & Waterson (1997) and von Ungern-Sternberg (1996) for recent models of countervailing power with upstream monopolies. These papers study the effects of increasing downstream concentration on end prices. Our focus is different: We wish to study the effect of improving price transparency.

[7] Thus our focus differs from that of Snyder (1996) who have upstream firms collude in a dynamic model of countervailing power. In an infinitely repeated procurement auction the sole buyer may accumulate a backlog of unfilled orders thus forcing sellers to collude on a low price (rather than on a high price) in order to prevent undercutting. Nilsson (1999) and Møllgaard and Overgaard (2000) also model market transparency (regarding prices and qualities, respectively) in dynamic oligopoly models, but do not give customers power to negotiate prices.

The benefit of transparency may thus arise because of improved information in the bargaining of terms of the transaction between upstream and downstream firms regarding the intermediate goods. We model the effect of price transparency by assuming that the buyers in one market segment are better informed about the true (marginal) cost of production than the buyers in the other segment. If the ill-informed buyers observe the prices (or the discounts) that obtain in the other market segment, they improve the precision of their estimate and this may lead them to take a tougher stand in the bargaining.[8] For this to make sense, it must be that the informed buyers negotiate their prices with producers before ill-informed buyers do the same, so we model the transparency policy as introducing sequentiality in an otherwise independent environment. Obviously, if the transparency policy is announced, producers will now know that the discounts that they give to informed customers will later be used by their previously ill informed customers. This, in turn, will lead the producers to take a different (tougher) bargaining stand with their informed customers since more is now at stake than before. It is thus not evident that (average) prices will decrease as a result of the transparency policy.

In the base model, which is set up in section 2, we assume for simplicity that there are two downstream firms, one of which is informed and one of which is not and that although these two firms purchase the same input, they are independent in their final goods market.[9] With one upstream firm, we then have two sets of bilateral monopolies and we analyse the non-transparency case of independent markets in section 3.1 while section 3.2 analyses the transparency case in which markets are treated as sequential. Section 3.2 also compares the regimes and demonstrates that transparency will raise the price in the informed market and lower the price in the uninformed market. The result arises exactly for the reason given in the previous paragraph: The information spill-over leads the upstream firm to be more aggressive in the informed segment. As the motivation for the transparency policy appears to arise at

[8] Because of our stated aim, we assume that the negotiation of the intermediate goods price does not reveal all relevant information (in which case a policy of transparency would be redundant).

[9] We avoid competition between downstream firms because that would open up a separate set of issues relating to the upstream firm's price discrimination between trading partners leaving them on an unequal footing in competition. This would be illegal according to article 82 of the Treaty of Amsterdam (that prohibits 'applying dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage') and according to the Robinson-Patman Act. The modelling of downstream competition is taken up by McAfee and Schwartz (1994), Dobson and Waterson (1997) and von Ungern-Sternberg (1998), while O'Brien and Shaffer (1994) deal explicitly with the welfare effects of forbidding discriminatory pricing of intermediate goods in the context of Robinson-Patman.

least partially from a wish to protect weaker economic agents, we assume in the first extension in section 4.1 that the uninformed is relatively unsophisticated when it comes to updating its beliefs. Two other extensions are considered in section 4: competition among downstream firms and sequentiality of moves. Section 5 concludes.

2 The model

Consider an upstream monopolist (Manufacturer) who produces an intermediate product with constant marginal costs c, which are commonly known to be uniformly distributed on $[\underline{c}, \overline{c}]$ and assume that M knows the true value of c before negotiating with any potential buyers. The monopolist sells to two downstream "retailers", an informed one who knows the true value of c (R_I) and an uninformed one who only knows the distribution of c (R_U). For simplicity, assume that the final demands of the two retailers are independent so that both are monopolists in their own market. Final goods demands are $D_i(P_i)$ where $i = I, U$ indicates whether the downstream firm is informed (I) or uninformed (U). Assume that $\frac{dD_i(P_i)}{dP_i} < 0$. One unit of the upstream good is transformed to one unit of the downstream good and downstream firms have no other variable costs.

The manufacturer negotiates with each of the retailers about the conditions of trade. For simplicity, we assume that in each bargaining situation, M gets to propose a take-it-or-leave-it offer with probability γ and R_i gets to propose an ultimatum with probability $1-\gamma$. The contract terms which can be agreed are restricted to two-part tariffs,[10] (w_i, F_i),where w_i is the transfer price and F_i is the fixed element, so the payment from Ri to M takes the form $F_i + w_i D_i(P_i)$. Once an agreement has been reached in market i, Ri chooses its price optimally, i.e. it sets the price $P_i^*(w_i)$ that solves

$$\frac{d\Pi_{Ri}}{dP_i} = D_i(P_i) + (P_i - w_i)\frac{dD_i(P_i)}{dP_i} = 0. \tag{1}$$

Assume that Π_{Ri} is concave, i.e. $\frac{d^2\Pi_{Ri}}{dP_i^2} = 2\frac{dD_i(P_i)}{dP_i} + (P_i - w_i)\frac{d^2D_i(P_i)}{dP_i^2} < 0$ and note that

$$\frac{dP_i^*}{dw_i} = -\frac{-\frac{dD_i(P_i)}{dP_i}}{\frac{d^2\Pi_{Ri}}{dP_i^2}} > 0$$

[10] In general, we just need efficient bargaining (given beliefs) but two-part tariffs are a simple way of achieving exactly this. Furthermore, the two-part tariff is one of the most basic pricing schemes (see McAfee and Schwartz (1994)).

Thus the higher is the transfer price w_i, the higher is the final goods price, P_i^*.

When M and Ri negotiate about contract terms, they know that their respective profits in market i depend on these terms as follows:

$$\Pi_{Mi}(w_i, F_i) = (w_i - c) D_i(P_i^*(w_i)) + F_i, \qquad i = I, U$$

and

$$\Pi_{Ri}(w_i, F_i) = (P_i^*(w_i) - w_i) D_i(P_i^*(w_i)) - F_i, \qquad i = I, U.$$

Finally, assume that a firm accepts all offers which lead to non-negative profits.

The total surplus generated in vertical chain i, $S_i(w_i, F_i) = \Pi_{Mi}(w_i, F_i) + \Pi_{Ri}(w_i, F_i)$ can be written as

$$S_i(w_i) = (P_i^*(w_i) - c) D_i(P_i^*(w_i)) \tag{2}$$

Note that (2) is independent of F_i and hence that w_i determines the size of the surplus, whereas F_i determine the allocation of this surplus. Finally, to ensure that trade is always profitable, we assume that $P_i^*(w_i) > \overline{c}$.

The transparency policy means making (w_I, F_I) observeable to others and in particular to R_U. This information may be useful to R_U as (w_I, F_I) may be based on private information about c. For this information to be of any use to R_U is has to be the case that it observes (w_I, F_I) before negotiating with M. We have chosen to model this as if the two bargains actually takes place sequentially so that M first negotiate with R_I and then with R_U. The obvious alternative would be to consider a two-period model, in which observation took place after the first period. As demonstrated in section 4.3, nothing is added by the two-period model other than notational complexity and we have decided to use the simpler structure. The difference between no-transparency and transparency is thus whether there is an informational link between the two markets.

3 The effect of transparency

We first solve the model under the assumption of no transparency, where we can treat the two bargaining situations independently since demands are independent and the (perceived) costs are independent. We then turn to the case of transparency and finally compare the outcomes to assess the effect of transparency.

3.1 No transparency

The main effect of the lack of price transparency is that the uninformed retailer, when making a take-it-or-leave-it offer, does not know the true value of c nor has the retailer any means of making any inference about c. The implication of this is that it may either propose a transfer price which leaves positive surplus in the hand of the manufacturer, or a transfer price which would be rejected by the manufacturer leading to no trade. We summarise the equilibrium contract terms in the lemma below. All proofs are found in the appendix.

Lemma 1 *When the government does not pursue a policy of transparency,*

1. *the contract terms agreed in the uninformed market are*

$$(w_u^*, F_U^*) = \begin{cases} (c, S_U(c)) & \text{if } M \text{ proposes the contract} \\ \left(\underline{c} + \frac{\left(P_U^*(w_U^*) - \underline{c}\right)}{2}, 0\right) & \text{if } R_U \text{ proposes the contract and } \overline{c} > \widehat{c} \\ (\overline{c}, 0) & \text{if } R_U \text{ proposes the contract and } \overline{c} \leq \widehat{c} \end{cases}$$

   where $\widehat{c}$ *solves* $\widehat{c} - \underline{c} = P_U^*(\widehat{c}) - \widehat{c}$. *Iff* $\overline{c} > \widehat{c}$, *trade fails to take place with probability* $(1-\gamma)\left(1 - \frac{P_U^*(w_U^*) - \underline{c}}{2(\overline{c} - \underline{c})}\right) > 0$.

2. *the contract terms agreed in the informed market are*

$$(w_I^*, F_I^*) = \begin{cases} (c, S_I(c)) & \text{if } M \text{ proposes the contract} \\ (c, 0) & \text{if } R_I \text{ proposes the contract} \end{cases}$$

   Trade occurs with probability one.

Welfare losses may arise for two reasons, double marginalisation, which occurs if $w_i > c$ and a failure to realise mutually beneficial trade. From lemma 1, it is clear that neither source contribute to any welfare loss in the informed market. To understand the effect on the uninformed market, the folowing corollary is helpful.

Corollary 2 *If the retailer proposes the contract in the uninformed market and if trade takes place,* $w_U^* \geq c$.

The corollary follows directly from $F_U^* = 0$ when R_u makes the offer; in that case M only accepts the offer if $w_U^* \geq c$. The lemma and corollary together thus identify two sources of

welfare losses. On the one hand, if trade takes place, the transfer price is weakly greater than the true marginal costs of the manufacturer and strictly so when the uninformed makes the offer. This welfare loss is higher, the lower is the true costs. On the other hand, if the range of possible costs are high, which in our case correspond to a high variance of costs, welfare enhancing trade may fail to take place at all. However, note that the latter failure occurs when the true marginal costs are high, which to some extent mitigates the welfare loss in this case. The extent to which this second source is an artefact of the bargainning game will be discussed in the conclusion.

3.2 Transparency

Transparency introduces sequentiality, enabling the uninformed retailer to observe w_I. Since w_I may be based on the private information of M and R_I, it may be worthwhile for R_U to try to unravel the true value of c from the observed w_I. Since (either of) the informed take an action before the informed, we have a signalling game. This particular game, where the type space is a continuum, $[\underline{c}, \overline{c}]$, belongs to the class of signalling games studied in Mailath (1987) and we can use his approach to solve the game. As we are interested in the ability of transparency to lead to information transmission from the informed to the uninformed, we focus solely on a separating equilibrium, which for the class studied by Mailath (1987) is unique.

M or R_I (depending on who is chosen to make the first-period offer) will observe the type (i.e. the true c) and then propose a $w_I = \tau(c)$ knowing that R_U will observe w_I and infer that the true type is $\tau^{-1}(w_I)$.

Lemma 3 *When the government pursues a policy of transparency, trade always occur, and*

1. *the contract terms agreed in the uninformed market are*

$$(w_u^{**}, F_U^{**}) = \begin{cases} (c, S_U(c)) & \text{if } M \text{ proposes the contract} \\ (c, 0) & \text{if } R_U \text{ proposes the contract} \end{cases}$$

2. *the contract terms agreed in the informed market are*

$$(w_I^{**}, F_I^{**}) = \begin{cases} (\tau(c), (P_I^* - \tau(c)) D_I(P_I^*)) & \text{if } M \text{ proposes the contract} \\ (\tau(c), -(\tau(c) - c) D_I(P_I^*)) & \text{if } R_I \text{ proposes the contract} \end{cases}$$

where $\tau(c) > c$ for $c > \underline{c}$ and $\tau(c) = c$ for $c = \underline{c}$.

Transparency thus has three effects, two of which are clearly welfare enhancing. Firstly, trade always takes place. Secondly, there is no double mark-up in the uninformed segment, which is also welfare enhancing. However, we now get double marginalisation in the informed segment, which is welfare reducing.

Transparency always raises the wholesale price in the informed segment thus reducing the surplus in this segment and harming the final customers of the informed downstream firm, RI. On the other hand, transparency reduces the wholesale price in the uninformed segment which will in turn affect the surplus and the final customers of the uninformed downstream firm, RU and lead to increased trade. Finally, transparency also increase weakly the likelihood that trade takes place. Combining lemma 1 and 2, we may summarise the effect of transparency in the following proposition:

Proposition 4 *Price transparency always raises the final goods price in the informed market and decreases the final goods price in the uninformed market. Moreover, in cases where the costs have a high variance, it makes trade in the uninformed market more likely. The first effect decreases welfare, while the two other effects increase welfare. The overall effect is thus ambiguous.*

Note that the main effect of transparency is to shift double marginalisation from one market to another. One would therefore expect the evaluation of transparency as a remedy in competition cases to depend on the facts of individual cases. Clearly transparency is more likely to have positive welfare effects when the uninformed market is large and economically, or even politically, important.

4 Extensions

A number of possible extensions can be considered. We are assumning that the uninformed retailers are very sophisticated and able to solve the complicated information extraction problems of signalling games. For policy purposes it is important to know how robust our results are to that assumption, something which we address in section 4.1. Secondly, in section 4.2 we discuss what happens when there is some degree of competition between the two segments. Finally, section 4.3 look at the order of moves to assess whether out simplifying assumption

affected our results.

4.1 Naive uninformed firms

In the model we have assumed that the uninformed are extremely rational and sophisticated, enabling them to unravel the information contained in the transparent prices correctly. In many cases of real world policy, this may seem an unduly strong assumption. In order to check the robustness of our results against the existence of less sophisticated agents, we want to consider the other possible extreme where the uninformed are also very naive. They naturally cannot be so naive that they do not realise that the transfer price in the informed segment may contain relevant information and hence the naivety must stem from how they make inference. The most naive we could ever let the uninformed be is that they understand that the informed use their information when choosing the transfer price and the underlying model which predicts that the transfer price is set equal to the marginal costs of the upstream firm. The naivety of the uninformed is thus that they do not understand that the two markets become linked, since were the two market not linked, they would be correct in their beliefs.

With naive updating, the no-transparency case remains the same. Also the transparency situation in which M gets to make the offer to RU is identical: M will suggest $w_U^{**} = c$ and take all the surplus by means of the fixed fee. This situation occurs with probability γ. Only the situation in which RU gets to make the offer will change: RU now believes with certainty that the true marginal cost is $\widehat{c} = w_I^{**}$. Her take-it-or-leave-it offer will be

$$(w_U^{**}, F_U^{**}) = (w_I^{**}, S_U(w_I^{**}))$$

which will leave a rent to M from this market of the size

$$(w_I^{**} - c)D_U(P_U(w_I^{**})).$$

So whoever makes the offer in the informed segment (RI or M) will try to appropriate this extra rent and thus solve the following maximisation problem (see the proof of lemma 2 for an explanation):

$$\max_{w_I}(P_I^*(w_I) - c)D_I(P_I^*(w_I)) + (1-\gamma)(w_I - c)D_U(P_U^*(w_I)) + \gamma S_U(c)$$

which implies that the mark-up in *both* markets will be

$$w_I - c = \frac{(1-\gamma)D_U(P_U^*(w_I))}{-\left(\frac{dD_I}{dP_I}\frac{dP_I^*}{dw_I} + (1-\gamma)\frac{dD_U}{dP_U}\frac{dP_U^*}{dw_U}\right)} > 0 \text{ for } \gamma < 1.$$

The effect of the naivity of the uninformed retailer is thus that double-marginalization will be spread evenly over the two segments (except, obviously, when $\gamma = 1$ so the retailers do not have any bargaining power). On the other hand, there will always be trade in this setting, so the third inefficiency vanishes (because RU's offer will always have $w_U^{**} > c$).

4.2 Competition between the segments

If the two retailers are competing, the incentive to bias the inference of the uninformed still exist. It will clearly be tempered by the losses in the total revenue from the change in the way the firms compete, but the upstream firm will prefer to bias the prices because although it leads to a lower overall profit, the upstream firm will get a larger slice of this.

The results of McAfee and Schwartz (1994) and O'Brien and Shaffer (1994) may also be interpreted in terms of transparency. They focus on the effect of transparency on strengthening the commitment of firms not to renegotiate contracts between upstream and downstream firms.

McAfee and Schwartz (1994) study bilateral contracting between an input supplier and (contrary to our model) competing downstream firms without commitment regarding other contracts' terms. Each downstream firm then fears renegotiation between the upstream firm and its rival(s). They show that nondiscrimination clauses generally are not sufficient to assuage such fears and that crude forms of commitment may be adopted to reassure the downstream firms. In particular, contract terms may be made transparent and uniform across firms in order to reduce the scope for camouflaging selective discounting.

O'Brien and Shaffer (1994) analyse the effect of the Robinson-Patman act which made it unlawful for an upstream firm to discriminate in price between two different downstream firms. Their model is a three stage game between one manufacturer and two retailers in which the manufacturer first publicly announce the supply terms for each retailer. Subsequently, private renegotiation between retailer(s) and manufacturer may take place. Finally the retailers compete. The effect of the Robinson-Patman act in the model is either to rule out any renegotiation at all or to limit the renegotiation to a fixed fee, thus fixing the transfer price at the initial announcement by the manufacturer, thereby making it transparent. This implies that in their

model, we can equate Robinson-Patman with transparency of transfer prices. Their result is that the Robinson-Patman act lead to higher transfer prices and retail prices and hence by implication to the conclusion that transparency is detrimental for welfare. The class of models considered by O'Brien and Shaffer (1994) thus offers no support for the use of transparency in competition policy.

4.3 Two-period model: Sequential moves.

The results so far depend on the bargaining between the manufacturer and the informed retailer is concluded first. This may seem unduly restrictive. Assume as an alternative that there are two periods and in each period, the two negotiations occur simultaneously. Transparency in this set up amounts to assuming that period one prices are known to all before period two bargains are concluded. Transparency has no effect on the uninformed firm in period one because it has no useful information about the marginal costs of the upstream firm yet. Thus the first-period wholesale price is w_U^* in both regimes. Similarly, there is no effect in the informed segment in the second period as there is no future to affect: $w_I^* = c$. The only effect is thus on the informed segment in period one and the uninformed segment in period two. In the regime without transparency, $W_1^I = w_I^*$ and $W_2^U = w_U^*$ while in the regime with transparency, these become $W_1^I = w_I^{**} = W_2^U = w_U^{**}$ as in section 3.2.

5 Conclusion

From the analysis in this paper it is clear that the main effect of the tranparency policy in markets with countervailing power is the shifting of most or all of the double marginalisation problem from the uninformed segment to the informed segment. Thus we have demonstrated that it may be the case that increased transparency leads to lower prices on average. However, for this to be the case, it must be true that the uninformed segment is much more important in terms of demand than is the informed segment. Empirically, one might expect the opposite to be true in most industries and thus it would appear more likely that the average price goes up rather than down.

Our model predict price movements following a shift to transparency which are similar to the theories based on transparency improving firms ability to collude, such as Albæk et al

(1997) or Nilsson (1999). To distinguish between these theories, note that, while both would predict that the price charged to informed firms would be increased, the countervailing power model predicts that the average price to the uninformed will fall. Thus if all prices rise after the shift to transparency, the collusion model is more credible, whereas if prices fall to some customers, in particular to smaller customers, the countervailing power model is more credible.

The positive effect that transparency guarantee trade which might not otherwise have occurred is at least to some extent an artefact of the bargaining game which we have adopted. For example, if the manufacturer could make a counter proposal, trade might eventually occur. In order to evaluate the transparency policy, it is important not to adopt a bargaining model which ensures that the bargaining process reveals the private information as this would render the policy redundant. Thus we have restricted attention to finite bargaining games, in which information revelation may not occur, but which may also imply non-trade. Importantly, the intuition provided by the model, that transparency affects the degree of double marginalisation in submarkets is very robust as is evident form comparing sections 3 with 4.1 and does not depend on the bargaining model.

Our paper then adds to the doubt about the general appropriateness of transparency as an instrument for competition policy and consumer protection policy in concentrated markets.

Appendix

Proof of Lemma 1: Even though we have assumed that the bargains happen sequentially, we can treat them entirely separately when there is no price transparency. As the informed market is the easier to solve, we prove part 2 first

Part 2: Given the bargaining set-up, whoever gets to propose the contract will keep the other part at her reservation level by appropriate choice of F and hence will choose w to maximise total surplus, which, as both know the true value of c, is the same for either firm. Maximizing $S_I(w_I)$ w.r.t. w_I yields the first-order condition

$$\frac{dS_I(w_I)}{dw_I} = \frac{dP_I^*}{dw_I}\left(D_I(P_I^*(w_I)) + (P_I^*(w_I) - c)\frac{dD_I(P_I^*(w_I))}{dP_i}\right) = 0 \tag{3}$$

which, combined with (1) reduces to

$$(w_I - c)\frac{dD_I\left(P_I^*\left(w_I\right)\right)}{dP_i}\frac{dP_I^*}{dw_I} = 0$$

As $\frac{dP_I^*}{dw_I} > 0$ and $\frac{dD_I\left(P_I^*(w_I)\right)}{dP_i} < 0$, we get $w_I = c$. Given w_I, all surplus will be in the retail market, $S_I\left(c\right) = \Pi_{RI}\left(c\right)$ and M will demand this surplus when proposing a contract. Likewise, R_I will keep all the surplus by setting $F_I = 0$.

Part 1: As in part 2, M will propose $w_U^* = c$ to maximize the surplus and use the fixed fee to extract all the rent from uninformed retailer. $F_U^* = S_U(c)$. As this yield R_U normal profits of 0, R_U accepts the contract.

If R_U is making the offer, M will only accept it if her profit is non-negative, i.e. if

$$(w_U - c)D_U\left(P_U^*\left(w_U\right)\right) + F_U > 0$$

or if

$$c \leq w_U + \frac{F_U}{D_U(P_U^*(w_U))} \tag{4}$$

The uninformed retailer can then pursue two different strategies. It can choose (w, F) such that trade always takes place or accept that trade may fail. In the first case, the retailer maximises its profits, $\left(P_U^*\left(w\right) - w\right)D_U\left(P_U^*\left(w\right)\right) - F$, given the constraint that

$$\left(w - \overline{c}\right)D_U\left(P_U^*\left(w\right)\right) + F_U = 0$$

which yields the solution $w = \overline{c}$ and $F = 0$.

In the second case, the probability of an offer (w_U, F_U) being accepted is

$$\Pr\left[c \leq w_U + \frac{F_U}{D_U\left(P_U^*(w_U)\right)}\right] = \frac{w_U + \frac{F_U}{D_U\left(P_U^*(w_U)\right)} - \underline{c}}{\overline{c} - \underline{c}} \equiv \varphi(w_U)$$

and hence the expected profit of making the offer (w_U, F_U) is

$$\max_{w_U, F_U} \left[\left(P_U^*(w_U) - w_U\right) D_U\left(P_U^*(w_U)\right) - F_U\right] \varphi(w_U) + 0(1 - \varphi(w_U))$$

subject to the condition that $\varphi(w_U) \leq 1$, which we will check at the end. The first order condition w.r.t. F_U is

$$\frac{\left[\left(P_U^*(w_U) - w_U\right) D_U\left(P_U^*(w_U)\right) - F_U\right]}{\left(\overline{c} - \underline{c}\right) D_U\left(P_U^*(w_U)\right)} - \left(\frac{w_U - \underline{c}}{\left(\overline{c} - \underline{c}\right)} + \frac{F_U}{\left(\overline{c} - \underline{c}\right) D_U\left(P_U^*(w_U)\right)}\right) = 0$$

which simplifies to:

$$F_U = \left(\frac{P_U^*(w_U) + \underline{c}}{2} - w_U\right) D_U\left(P_U^*(w_U)\right) \tag{5}$$

Using (1) and (5), the first order condition w.r.t. w_U can be written as

$$\left(\frac{P_U^*(w_U) - \underline{c}}{2}\right) \frac{\left(\frac{P_U^*(w_U) + \underline{c}}{2} - w_U\right)}{D_U} \frac{dD_U}{dP_U} \frac{dP_U^*}{dw_U} = 0$$

so that, either $P_U^*(w_U) - \underline{c} = 0$ or $\frac{P_U^*(w_U) + \underline{c}}{2} - w_U = 0$. The first solution implies that $F_U^* = \left(\underline{c} - w_U\right) D_U\left(P_U^*(w_U)\right)$ whereas the second implies that $F_U^* = 0$. In the first case $\varphi(w_U) = 0$ and hence expected profit zero. The expected payoff in the second case is

$$\frac{\left(P_U^*(w_U^*) - \underline{c}\right)^2}{4\left(\overline{c} - \underline{c}\right)} D_U\left(P_U^*(w_U^*)\right) > 0$$

and hence the equilibrium contract when the uninformed makes the offer is the solution to

$$w_U = \underline{c} + \frac{\left(P_U^*(w_U) - \underline{c}\right)}{2} \tag{6}$$

denoted w_U^*, and $F_U^* = 0$. To show that a solution to (6) exist, define

$$f(w) = w - \underline{c} - \frac{\left(P_U^*(w) - \underline{c}\right)}{2}$$

and note that $\frac{df}{dw} = 1 - \frac{1}{2}\frac{dP^*}{dw} > 0$ under mild restrictions on the demand function, i.e. it cannot be too convex. Moreover, $f(\underline{c}) < 0$. Hence $w_U^* > \underline{c}$.

Now define $\widehat{c}$ as the solution to $f(\widehat{c}) = 0$, i.e.

$$\widehat{c} - \underline{c} - \frac{(P_U^*(\widehat{c}) - \underline{c})}{2} = 0$$

which we can write as

$$\widehat{c} - \underline{c} = P_U^*(\widehat{c}) - \widehat{c}$$

It is clear that for $\overline{c} \leq \widehat{c}$, $\varphi(w_U^*) \geq 1$ so trade occurs for sure and $w = \overline{c}$. Whereas for $\overline{c} > \widehat{c}$, $\varphi(w_U^*) = \frac{P_U^*(w_U^*) - \underline{c}}{2(\overline{c} - \underline{c})} < 1$ so no trade occurs for high values for c and $w = w_U^*$.

To derive the probability that thrade does not occur, recall that R_U gets to make the proposal with probability $1 - \gamma$ and use the above expression for $\varphi(w_U^*)$. ■

Proof of Lemma 2: The game is now truly sequential, and we solve it backwards, starting with the uninformed segment. If M, who is informed, is chosen to propose, she will suggest the full-information solution

$$(w_U^{**}, F_U^{**}) = (c, S_U(c))$$

which will maximize her profits.

If R_U, who now believes that the cost is $\widehat{c} = \tau^{-1}(w_I)$ is chosen to propose, she will suggest a contract, that she believes will keep M at her reservation value while maximising total surplus:

$$(w_U^{**}, F_U^{**}) = (\widehat{c}, 0)$$

so M's expected profit in this segment from reaching an agreement is[11]

$$E\pi_{MU}(\hat{c}) = (1 - \gamma)(\widehat{c} - c) D_U(P_U^*(\widehat{c}))$$

Note that in this case

$$\frac{dE\pi_{MU}(\hat{c})}{d\hat{c}} = (1 - \gamma)\left(D_U + (\widehat{c} - c)\frac{dD_U}{dP_U}\frac{dP_U^*}{dw_U}\right)$$

which is clearly positive when evaluated at $\widehat{c} = c$. Thus M would gain from the uninformed market if it could bias the beliefs of R_U upwards so long at it does not do so by too much.

[11] If they do not reach an agrement in the informed segment, it is as if there was no transparancy and hence M would get $\gamma S_U(c)$.

Turning to the informed segment, if M is chosen to propose, she will keep R_I at her reservation value of 0 by setting

$$F_I = \left(P_I^*\left(w_I\right) - w_I\right) D_I\left(P_I^*\left(w_I\right)\right)$$

and then solve the following maximization problem

$$\begin{aligned} \max_{w_I} U(c, \widehat{c}, w_I) &= \max_{w_I} \left(w_I - c\right) D_I\left(P_I^*\left(w_I\right)\right) + F_I + E\pi_M^U\left(\hat{c}\right) \\ &= \max_{w_I} \left(P_I^*\left(w_I\right) - c\right) D_I\left(P_I^*\left(w_I\right)\right) + E\pi_M^U\left(\hat{c}\right) \end{aligned} \tag{7}$$

If R_I is chosen to propose, she will keep M at her reservation level of 0 by setting

$$F_I = -\left(w_I - c\right) D_I\left(P_I^*\left(w_I\right)\right) - E\pi_M^U\left(\hat{c}\right)$$

and then solve the following maximization problem

$$\begin{aligned} \max_{w_I} U(c, \widehat{c}, w_I) &= \max_{w_I} \left(P_I^*\left(w_I\right) - w_I\right) D_I\left(P_I^*\left(w_I\right)\right) - F_I \\ &= \max_{w_I} \left(P_I^*\left(w_I\right) - c\right) D_I\left(P_I^*\left(w_I\right)\right) + E\pi_M^U\left(\hat{c}\right) \end{aligned} \tag{8}$$

It is evident that both proposers are solving the same problem and hence will make the same offer. Hence the uninformed need not to know who has made the offer in order to make his inference.

The first order condition to (7) or (8) is given by[12]

$$\left(P_I^*\left(w_I\right) - c\right) \frac{dD_I}{dP_I} \frac{dP_I^*}{dw_I} + D_I\left(P_I^*\left(w_I\right)\right) \frac{dP_I^*}{dw_I} + \frac{dE\pi_{MU}(\hat{c}\left(w_I\right))}{dw_I} = 0$$

Using (1), we can write this as

$$\left(w_I - c\right) \frac{dD_I}{dP_I} \frac{dP_I^*}{dw_I} + \left(1 - \gamma\right) \left(D_U + \left(\tau^{-1}\left(w_I\right) - c\right) \frac{dD_U}{dP_U} \frac{dP_U^*}{dw_U}\right) \frac{d\tau^{-1}}{dw_I} = 0 \tag{9}$$

In a separating equilibrium, the inference of the uninformed must be correct and hence $\tau^{-1}(w_I) = c$ in which case (9) can be written as

$$\left(w_I - c\right) \frac{dD_I}{dP_I} \frac{dP_I^*}{dw_I} + \left(1 - \gamma\right) D_U \frac{dc}{dw_I} = 0 \tag{10}$$

or equivalently as the differential equation

$$\frac{dw_I}{dc} = -\frac{\left(1 - \gamma\right) D_U}{\left(w_I - c\right) \frac{dD_I}{dP_I} \frac{dP_I^*}{dw_I}}$$

[12] By satisfying this first order condition, $w_I^*\left(c\right)$ will be incentive compatible.

from which we get $w_I^{**}(c)$. Although we cannot solve the differential equation, we can use the method in Mailath (1987) to characterise the equilibrium. Note that

$$\frac{\partial^2 U(c,\widehat{c},w_I)}{\partial c \partial w_I} = -\frac{dD_I}{dP_I}\frac{dP_I^*}{dw_I} > 0$$

and thus the higher is c, the higher is w_I which implies that $\frac{dw_I^{**}(c)}{dc} > 0$ and hence from (10), as $\frac{dD_I}{dP_I}\frac{dP_I^*}{dw_I} < 0$, that $w_I^{**}(c) > c$. Moreover, recall that $\frac{\partial U(c,\widehat{c},w_I)}{\partial \widehat{c}} > 0$ around the equilibrium, which implies that the biasing is always upwards, $w_I^{**}(c) > c$. This bias is costly for the informed firms, but unavoidable given the inference that w_I overstates the marginal costs, except in one case, when $c = \underline{c}$ where the firms can safely set $w_I = c$ as they can never be believed to have lower costs than $\underline{c}$.

In this case,

$$F_I = \left(P_I^*\left(w_I^{**}(c)\right) - w_I^{**}(c)\right) D_I\left(P_I^*\left(w_I^{**}(c)\right)\right)$$

if M makes the proposal and

$$F_I = -\left(w_I^{**}(c) - c\right) D_I\left(P_I^*\left(w_I^{**}(c)\right)\right)$$

as the additional profit in the uninformed market is zero as the R_U makes a correct inference in equilibrium. ■

LITERATURE:

Albæk, S.; H.P. Møllgaard & P.B. Overgaard (1996) "Law-Assisted Collusion? The Transparency Principle of the Danish Competition Act," *European Competition Law Review* 17(6), 339-343.

Albæk, S.; H.P. Møllgaard & P.B. Overgaard (1997) "Govenment-Assisted Oligopoly Coordination? A *Concrete* Case," *Journal of Industrial Economics* 45: 429-443.

Albæk, S.; H.P. Møllgaard & P.B. Overgaard (1998) "The Danish Competition Act and Barriers to Entry," Chapter 5 of Stephen Martin (ed.) *Competition Policies in Europe*, Elsevier Science B.V.

Competition Council (1994a) *KonkurrenceNyt* (Newsletter: May 11, 1994), 2.

Competition Council (1994b) *KonkurrenceNyt* (Newsletter: July 11, 1994), 4.

Competition Council (1995a) *KonkurrenceNyt* (Newsletter: June 22, 1995), 2.

Competition Council (1995b) *KonkurrenceNyt* (Newsletter: Dec. 20, 1995), 2.

Competition Council (1996a) *KonkurrenceNyt* (Newsletter: Mar. 7, 1996), Insert.

Competition Council (1996b) *KonkurrenceNyt* (Newsletter: Oct. 10, 1996), 3-5.

Danish Ministry of Trade and Industry (1999) *Tæt på Erhvervspolitikken* (*Industrial Policy Up Close*), Copenhagen, Denmark (available on http://www.em.dk/publika/markedspol/).

Dobson, P.W. and M. Waterson, 1996, "The Competition Effects of Resale Price Maintenance", mimeo, University of Warwick.

Dobson, P.W. & M. Waterson (1997) "Countervailing Power and Consumer Prices," *Economic Journal* 107(441): 418-430.

Galbraith, J.K. (1956) *American Capitalism – The Concept of Countervailing Power*, Boston: Houghton Mifflin Co. (2nd, revised edition).

Hart, O. & J. Tirole (1990) "Vertical Integration and Market Foreclosure" *Brookings Papers on Economic Activity*: 205-276.

Hviid, M. & H.P. Møllgaard (1999) "Countervailing Power and Price Transparency: The case of bilateral duopolies" *mimeo* Departments of Economics, University of Warwick and Copenhagen Business School.

McAfee, R.P. & M. Schwartz (1994) "Opportunism in Multilateral Vertical Contracting: Nondiscrimination, Exclusivity, and Uniformity" *American Economic Review* 84(1): 210-230.

Mailath, G.J., 1987, "Incentive Compatibility in Signalling Games with a Continuum of Types", Econometrica, 55, 1349-1365.

Møllgaard, H. P. & P. B. Overgaard (2000) "Market Transparency: A Mixed Blessing?" *CIE Working Paper* 99-15, Centre for Industrial Economics, University of Copenhagen.

Nilsson, Arvid (1999) "Transparency and Competition" *draft* Stockholm School of Econmomics.

O'Brien, D.P & G. Shaffer (1994) "The Welfare Effects of Forbidding Discriminatory Discounts: A Secondary Line Analysis of Robinson-Patman" *Journal of Law, Economics, and Organization* 10(2): 296-318.

Osborne, M.J. and A. Rubinstein (1990) *Bargaining and Markets* San Diego: Academic Press.

Snyder, C.M. (1996) "A Dynamic Theory of Countervailing Power" *RAND Journal of Economics* 27(4): 747-769.

Stigler, G. (1964) "A Theory of Oligopoly" *Journal of Political Economy* 72: 44-61.

von Ungern-Sternberg, T. (1996) "Countervailing Power Revisited," *International Journal of Industrial Organization* 14: 507-520.