Do Royalties: "have a disincentive effect on production"?*

by

Rob Fraser

and

Hild Rygnestad

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ABSTRACT

This paper analyses the impact of royalties in the context of a bilateral monopoly bargaining process. It is shown that the bilateral monopoly model is characterised by two distinct forms which are distinguished by the shape of the seller's marginal cost function, and that the view that royalties have a disincentive effect on production is unfounded for one of these forms. It is argued that the forms of bilateral monopoly can be differentiated by identifying the direction of the observed correlation between movements in traded prices and quantities. This proposal is investigated in the context of the Australian iron ore and coal industries, and it is suggested that, in the case of iron ore, royalties do not have a disincentive effect on production.

"Taxes based on the volume or value of production tax production at the margin and therefore have a disincentive effect on production" Emerson and Lloyd (1983, p240).

INTRODUCTION

The traditional justification for imposing royalties on extractive industries is based on the recognition of society's ownership of the resource, and therefore of the social or "user" cost of its extraction (Randall, 1987). As recognised by Emerson and Lloyd (1983), royalties as a tax on the volume or value of production will typically reduce the rate of resource extraction, thereby modifying the tendency for excessive production by a competitive industry focused only on price and the private marginal cost of extraction.

However, in the Australian context the generally-accepted argument has been that in many cases extractive industries do not closely resemble the competitive model. Moreover, once industry behaviour is acknowledged as imperfectly competitive, it is no longer clear that resource taxation should intentionally provide a disincentive to production. On this basis Emerson and Lloyd (1983) advocate the movement of the Australian resource taxation system away from specific or ad valorem royalties "to taxes based on annual profit" which "would entail less distortions of mineral production" (p243).

The purpose of this paper is not to dispute the economic rationale for this recommendation of Emerson and Lloyd (1983). However, as recognised by Smith (1977) (and more recently by Bowen and Gooday (1993)), levels of production in two of Australia's major resource industries, coal and iron ore, may not be based on decisions "at the margin", but rather be the outcome of a form of bilateral monopoly bargaining process.[1] It follows that in this case a

"tax on production at the margin" may not influence the actual level of production and therefore may not "have a disincentive effect on production".

Consequently, the primary objective of this paper is to investigate the impact of royalties in the context of a bilateral monopoly bargaining process. In so doing, the effect of royalties on production can be assessed, and the argument for extending the Emerson and Lloyd recommendation to the case of bilateral monopoly tested. Such an objective would seem particularly worthwhile given that coal and iron ore production are currently subject to specific and ad valorem royalties respectively.

The plan of the paper is as follows. Section 1 examines the structure of the bilateral monopoly model and demonstrates that it is characterised by two distinct forms. Moreover, the impact of the introduction of royalties into this model, particularly in relation to the level of production, is shown to be quite different for these two forms. Consequently, the validity of the "disincentive effect" claim for royalties is shown to depend on which of these forms applies in the market in question. Section 2 considers further the two forms of bilateral monopoly and proposes a method for identifying which is applicable to a given trading situation based on observed movements in prices and production levels. In particular, it is argued that the two forms are distinguished by whether contemporaneous movements in prices and production levels have a positive or a negative relationship. Section 3 takes this proposal further by applying it to actual data for the coal and iron ore industries in Australia. The empirical evidence supports the view that royalties do not have disincentive effect on the production of iron ore, but is inconclusive for coal. The paper ends with a brief conclusion.

SECTION 1: The Bilateral Monopoly Model

The two forms of the bilateral monopoly model can be distinguished by the shape of the monopoly producer's marginal cost function (mc), and its associated marginal factor cost function (mfc). The situation where the mc rises relatively sharply, and therefore is characterised by a significant divergence between the mc and the mfc, is represented in Figure 1 (Form 1). The alternative situation, where the mc rises relatively slowly and therefore is characterised by a smaller divergence between the mc and mfc, is represented in Figure 2 (Form 2). Moreover, by comparing these figures it can be seen that this functional shape distinction manifests itself in a fundamental difference between the two forms in the relative bargaining positions of the buyer and the seller. Specifically, in the situation represented by Figure 1 the preferred position of the buyer (A) features both a lower price and a lower quantity than that of the seller (B). By contrast, in the situation represented by Figure 2 the preferred position of the buyer (X) features a lower price but a higher quantity than that of the seller (Y).[2]

However, as recognised in the Introduction, these preferred positions are based on marginal analysis, whereas the actual price and quantity are determined as the outcome of a process of bilateral bargaining. Nevertheless, the feasible set of such price, quantity outcomes is itself determined by these preferred positions. In what follows we make the simplification of representing this set of feasible outcomes by the straight line connecting the preferred positions ($\overline{AB}$ and $\overline{XY}$). The justification for making this assumption is that the actual outcome is unlikely to diverge significantly from this line. For illustrative purposes, the initial position of agreement is specified by the points M (ie P_M, Q_M) and W (ie P_W, Q_W) for

Forms 1 and 2 respectively. Note that these points are chosen to be midway along the lines of feasible outcomes.[3]

Now consider the impact of introducing royalties into each of these situations. A royalty in the form of a tax on the volume or value of production will reduce the marginal revenue the seller receives from each unit sold. This impact can be represented by a downwards shift in the marginal revenue function (mr) in each situation.[4] Figures 3 and 4 depict the impact of introducing royalties for Forms 1 and 2 of the bilateral monopoly model, respectively. In these figures it can be seen that for each form the impact of the royalty is to shift the preferred position of the seller further up the demand curve (to B_R and Y_R respectively). One consequence of this change is an anti-clockwise rotation of the line of feasible outcomes. Assuming initially that the introduction of royalties does not change the balance of bargaining power between the buyer and the seller, the modified positions of agreement continue to occur at the midpoint of the lines of feasible outcomes: M^R in the case of Form 1 and W^R in the case of Form 2. Moreover, it is clear from Figures 3 and 4 that in each case the modified position of agreement features a higher price and lower quantity $\left(\text{ie } P_M^R, Q_M^R, \text{ and } P_W^R, Q_W^R\right)$ compared with the initial position.

However, the argument made here is that the introduction of a royalty will also modify the relative bargaining power of the buyer and the seller. In particular, it is suggested that the new requirement for the seller to bear the burden of royalty payments will weaken its financial position and therefore weaken its bargaining power.[5] If this argument is accepted, then the positions of agreement on the new lines of feasible outcomes will shift towards the preferred position of the buyer (ie A and X for Forms 1 and 2 respectively). In the case of Form 1, it can be seen that such a shift, for example to N, only serves to reinforce the

tendency for the introduction of the royalty to decrease the agreed quantity (ie from Q_M to Q_M^R to Q_N). By contrast, in the case of Form 2, it can be seen that such a shift, for example to Z, has a positive impact on quantity, and in this instance induces an overall increase in the new agreed quantity relative to that of the initial position of agreement (ie Q_Z compared to Q_w).

Consequently, in the case of Form 1 of the bilateral monopoly model, the validity of Emerson and Lloyd's "disincentive effect" claim for the impact of royalties on production is confirmed. However, in the case of Form 2, it has been argued that royalties can have an overall positive impact on production if the royalties induce a strong enough shift in the balance of bargaining power towards the buyer. Therefore, although it is clearly possible that this shift may not be strong enough to result in an overall increase in production, it can be concluded that the analysis of Form 2 of the bilateral monopoly model does not support the view that royalties decrease production.

SECTION 2: Identifying the Forms of Bilateral Monopoly

As can be seen from Figures 1 and 2, one distinguishing feature of the two forms of bilateral monopoly is whether the line of feasible outcomes is positively (Form 1) or negatively (Form 2) sloped. Based on this feature, it is argued here that the tendency for observed movements in traded prices and quantities to be either positively or negatively correlated is a means of identifying whether the prevailing model of bilateral monopoly is Form 1 or Form 2. In particular, it is suggested that a trading situation which features movements in prices and quantities which are positively correlated is evidence of Form 1, while a negative relationship is evidence of Form 2.

In order to develop this argument, consider initially the situation of static demand and marginal cost functions. In this situation, the residual source of movements in traded prices and quantities is the relative bargaining power of the buyer and the seller. As is clear from Figure 1, in the case of Form 1 of the bilateral monopoly model, fluctuations in the relative bargaining power of the buyer and the seller will be manifested as positively correlated movements in prices and quantities. Similarly, from Figure 2 it is clear that in the case of Form 2 such fluctuations will be manifested as negatively correlated movements in prices and quantities. Consequently, in the absence of any other sources of change, it can be concluded that an observation of positively correlated prices and quantities in a trading context best represented by the bilateral monopoly model is evidence of the existence of Form 1 of this model, while a negative correlation is evidence of Form 2.

But are such conclusions robust in the context of changes in both demand and marginal cost functions? Consider first the impact of an increase in demand for the product as represented in Figures 5 (Form 1) and 6 (Form 2). In both cases it can be seen that such an increase

results in a rightward-shift of the line of feasible outcomes: from $\overline{AB}$ to $\overline{A}_1\overline{B}_1$ in the case of Form 1; and from $\overline{XY}$ to $\overline{X}_1\overline{Y}_1$ in the case of Form 2. Moreover, in the absence of any associated change in the relative bargaining power of the buyer and the seller, it can be seen by comparing the respective midpoints of each line (ie M and M_1 in the case of Form 1; and W and W_1 in the case of Form 2) that the increase in demand results in an increase both in the agreed price in the agreed quantity. However, by the same means that the imposition of royalties was argued to reduce the bargaining power of the seller relative to the buyer (ie the impact on the seller's financial position), it is argued here that an increase in demand increases the relative bargaining power of the seller.

On this basis, the overall impact of the increase in demand on the position of agreement can be represented by the points N and Z in Figures 5 and 6 respectively. In the case of Form 1, Figure 5 shows that taking account of the shift in relative bargaining power associated with the increase in demand only serves to reinforce the tendency for this increase to result in positively correlated movements in the traded levels of price and quantity. However, in the case of Form 2, the shift in relative bargaining power towards the seller has a negative impact on quantity, and the outcome represented in Figure 6 depicts the impact of this shift as dominating the overall effect of the increase in demand on quantity traded.[6] Consequently, in this situation the increase in demand results in a negatively correlated movement in the agreed price and quantity. Therefore, although it is clearly possible in the case of Form 2 for the overall impact of increases in demand to result in positively correlated movements in prices and quantities (as is unambiguously the case for Form 1), the finding of a negative correlation in a trading context featuring demand fluctuations and best represented by the bilateral monopoly model is clear evidence of the existence of Form 2 of this model.

Finally in this section consider the impact of a decrease in the marginal cost of production such as might follow some technological advance. This situation is represented in Figures 7 and 8 for Forms 1 and 2 respectively. As with an increase in demand, in both cases it can be seen that such a decrease (from MC to MC_1) results in a rightward-shift of the line of feasible outcomes: from $\overline{AB}$ to $\overline{A}_1\overline{B}_1$ in the case of Form 1; and from $\overline{XY}$ to $\overline{X}_1\overline{Y}_1$ in the case of Form 2. Moreover, once again using the argument that a strengthening of the seller's financial position increases its bargaining power relative to the buyer, the overall impact of the decrease in marginal cost is represented in Figures 7 and 8 by the points N and Z for Forms 1 and 2 respectively.[7] Relative to the initial positions of agreement (M for Form 1; W for Form 2), these positions also feature a positive correlation between movements in the agreed price and quantity for Form 1, and a negative correlation for Form 2. And although it is recognised that the outcome of a positive correlation in the context of decreases in marginal cost for Form 1 is reliant on a minimum shift of bargaining power towards the seller (so that the agreed price for N exceeds that for M), it can be seen from Figure 7 that the magnitude of this minimum shift is inversely related to the elasticity of demand for the product. Consequently, in the case of ostensibly homogenous products like coal and iron ore, we would argue that this requirement represents only a minor restriction on the generality of our argument.

Specifically, we conclude that the finding of a positive correlation between the levels of price and quantity in a trading context best characterised by the bilateral monopoly model is evidence of Form 1 of this model if it is also the case that the relative bargaining power of the buyer and the seller is particularly responsive to changes in the financial strength of the seller. But more substantially, subject only to a minimal degree of this responsiveness, we conclude that the finding of a negative correlation between the traded levels of price and

quantity in a bilateral monopoly context can only be evidence of Form 2 of this model. Moreover, not only is this conclusion robust with respect to fluctuations in both demand and marginal cost, but also this conclusion is unconditional with respect to responsiveness in the level of relative bargaining power if fluctuations in the marginal cost function are insignificant.

Finally, by combining the conclusions of Sections 1 and 2, it can be seen that, as a negative correlation between traded prices and quantities in a bilateral monopoly context is evidence of Form 2 of this model, so it is also evidence that this context is one where royalties do not "have a disincentive effect on production". In the next section we report our attempts to apply these arguments with an investigation of actual data for the coal and iron ore industries in Australia.

SECTION 3: Empirical Analysis of Australia's Iron Ore and Coal Industries

Methods and Data

The following model can be used to estimate the price-quantity relationship for the two mining industries. The logarithmic form indicates that b_1 can be interpreted as the price elasticity:

$$\log q_t = b_0 + b_1 \log R_t + \mu_t. \quad (1)$$

However, time series data are often found to be non-stationary (Greene, 1990). The data are stationary if the mean, variance and pattern of variation between observations remain constant over time (Trott, 1995). Using an Ordinary Least Squares approach to level but non-stationary data may lead to a spurious correlation. The effect of non-stationarity may be accounted for by differencing the data or by using cointegration analysis. The latter aids obtaining long run elasticities without imposing a functional form, but this approach requires large data sets and is appropriate for models aimed at forecasting. By first differencing the data, a functional form is imposed on the estimated model, and potentially valuable information about the long run relationship is lost. This may reduce the forecasting ability of the model. Since the aim of this study is not forecasting but to determine the price-quantity relationship, first differencing the data is viewed as acceptable in this case. This is also supported through unit root tests determining whether the model residuals appear stationary. Thus, the model which is estimated can be described by:

$$d(\log q_t) = b_0 + b_1 d(\log R_t) + \mu_t \quad (2)$$

where d indicates that the first differenced value is used.

The data are analysed and the model in Equation (2) is estimated using MICROFIT for Windows (Version 4.0).

The data material is shown in Tables 1 (iron ore) and 3 (coal). The Western Australian iron ore industry is seen as representative for Australia as it constitutes over 95% of the total production level (ABARE, 1997). For the analysis of the iron ore industry the data material is limited to the period from 1971 to 1997. This is because prior to 1971 the industry was characterised by strong output growth following the initiation of mining in the early 1960s, whereas the analysis is concerned with the price-quantity relationship of an established industry. Similarly, coal production in New South Wales represents over 35% of the Australian production level (ABARE, 1997). As can be seen in Table 3 the data material is limited to the years between 1985 and 1997. This is because of the lack of data on production value prior to 1985.

Due to the difficulty in obtaining a representative output price in the two industries an approximation is obtained as shown in Tables 2 and 4, respectively. The real price is approximated by dividing the total value ($) of output by the amount produced (t), subtracting the average royalty paid every year ($/t) and applying a CPI deflator.

Results

For the WA iron ore industry the following functional relationship is estimated (T-ratios shown in parentheses):

$$d(\log q_t) = \underset{(1.96)}{0.037} - \underset{(-1.94)}{0.287}\, d(\log R_t) \qquad (3)$$

The adjusted R^2 for this relationship is 0.10 and a unit root test for the residuals indicates that these are stationary when the first differenced data are applied (ADF (1) = -3.98 with critical value = -3.61). Both estimated coefficients are significant at the 90% confidence level.

For the NSW coal industry the price-quantity relationship is estimated to be (T-ratios shown in parentheses):

$$d(\log q_t) = \underset{(2.12)}{0.051} + \underset{(0.51)}{0.162}\, d(\log R_t) \qquad (4)$$

The adjusted R^2 for this relationship is negative (-0.07) because of the small sample size, which makes it impossible to draw any conclusions based on this estimation.

Therefore, this empirical analysis shows that for the iron ore industry there is a significant negative price relationship with at least 90% but not with 95% certainty (ie -0.287 is significantly different from zero at a 6.5% level). Based on the discussion in sections 1 and 2, this can be taken as evidence of the existence of Form 2 of the bilateral monopoly model, and therefore of a situation where royalties do not "have a disincentive effect on production".[8]

CONCLUSION

The aim of this paper has been to investigate the impact of royalties in the context of a bilateral monopoly bargaining process, with the view to assessing whether the perceived inferiority of royalties relative to the RRT in terms of "distortions of mineral production" is valid in a situation where the seller's production level is not determined "at the margin".

Section 1 of the paper developed the structure of the bilateral monopoly model and showed that it is characterised by two distinct forms (Form 1 and Form 2). Moreover, it was shown that for Form 2 of this model, which features a relatively slowly rising marginal cost function in the region of the bargain, the impact of royalties on production is ambiguous, and may even be positive if the imposition of royalties results in a strong enough shift of relative bargaining power towards the buyer. Building on this finding, Section 2 of the paper developed a method for identifying which form of the model best described a trading situation characterised by bilateral monopoly. This method, which is based on observed movements in prices and production levels, was applied in Section 3 to data for Australia's iron ore and coal industries. The results of the analysis provided evidence to support the view that Form 2 of the bilateral monopoly model best described Australia's iron ore trade with Japan, and therefore supported the conclusion that in this situation there is no efficiency argument to favour an RRT over the existing royalty system.

REFERENCES

ABARE (1997). *Australian Commodity Statistics*. Australian Bureau of Agricultural and Resource Economics. Canberra.

Bowen, B. and Gooday, P. (1993) "Coal: The Economics of Coal Export Controls" ABARE Research Report 93.8, Canberra.

Chang, H.S. and Sheales, T.C. (1993) "Australian iron ore trade with Japan: factors affecting market share" *Agricultural and Resources Quarterly* 5(2):216-227.

Emerson, C. and Lloyd, P.J. (1983) "Improving mineral taxation policy in Australia" *Economic Record* 59(166):232-44.

Greene, W.H. (1990). *Econometric analysis*. 2nd Edition. Prentice-Hall Inc. Englewood Cliffs.

NSW Department of Mineral Resources (various years). Statistics on mine production, value of minerals and net crown royalty collections in New South Wales. Prepared by the Royalty Branch. St. Leonards.

Pesaran, M. H. and Pesaran, B. (1997). *Working with MICROFIT 4.0: Interactive Econometric Analysis*, Oxford University Press, Oxford.

Randall, A. (1987) *Resource Economics* 2nd Ed. Wiley and Sons, New York.

Smith, B. (1977) “Bilateral monopoly and export price bargaining in the resource goods trade” *Economic Record* 53(141):30-50.

Spindler, Z.A. (1974) “A simple determinate solution for bilateral monopoly” *Journal of Economic Studies* 1(1):55-64.

Trott, S. (1995). *Royalties and the Western Australian iron ore and gold industries*. The Faculty of Agriculture, the University of Western Australia, Honours Thesis.

WA Department of Minerals and Energy (various years). Statistics Digest. Perth.

WA State Budget Papers (various years). Estimates of Revenue and Expenditure. Perth.

FOOTNOTES

[1] See also Chang and Sheales (1993).

[2] Note that the special case where the preferred quantity of the buyer and the seller is identical is not considered here. It is, however, the focus of the analysis of Smith (1977).

[3] Based on Spindler (1974), Smith (1977) calls such points "the pure bilateral monopoly solutions" (p42).

[4] Note that with this change the demand curve can no longer be used to determine the seller's average revenue. In addition, this change has no impact on the positions of the mc and the mfc.

[5] Although we dispute its logical basis, we acknowledge that the arguments of Smith (1977) would favour the opposite view.

[6] Note that in the situation of decreases in demand the reverse arguments can be applied.

[7] Note that in the situation of increases in marginal cost the reverse arguments can be applied.

[8] Note that the adjusted R^2 is lowered by the small sample size suggesting the need for a longer time period to analyse output and price levels in both the iron ore and coal industries.

Table 1

Production level, value and royalty data,
Western Australia iron ore industry, 1971 - 1997.

(1) Year	(2) Production volume, Mt	(3) Production value, M$	(4) State royalty M$
1970/71	46.42	279.48	19.03
1971/72	52.67	316.39	22.45
1972/73	64.43	332.52	24.68
1973/74	82.40	392.90	30.58
1974/75	90.66	552.80	35.71
1975/76	86.09	619.80	38.25
1976/77	89.00	698.16	44.64
1977/78	94.94	797.32	44.85
1978/79	78.85	823.78	48.50
1979/80	91.52	992.87	52.43
1980/81	89.21	953.78	60.15
1981/82	82.52	1079.81	59.35
1982/83	75.34	1355.30	69.38
1983/84	72.60	1166.34	78.17
1984/85	87.73	1480.20	88.53
1985/86	92.99	1794.97	101.95
1986/87	92.47	1801.59	92.78
1987/88	97.97	1669.76	94.81
1988/89	92.98	1479.72	92.73
1989/90	106.27	2246.03	112.53
1990/91	107.67	2648.69	130.94
1991/92	111.07	2941.51	152.88
1992/93	111.73	2991.14	152.67
1993/94	119.69	2865.16	148.67
1994/95	133.13	2794.31	138.97
1995/96	132.90	2924.96	156.28
1996/97	141.29	3159.65	161.91

Note:
1.: Columns (2) and (3) from Trott (1995) and WA Department of Minerals and Energy (various years)
2.: Column (4) from WA State Budget Papers (various years)

Table 2

Approximating the price of iron ore, $/t,
based on production value and royalty payments.

(1) Year	(2) Production value, $/t	(3) State royalty, $/t	(4) Nominal approximate price (2) - (3), $/t	(5) CPI	(6) Real price, R, $/t
1970/71	6.02	0.41	5.61	14.96	37.50
1971/72	6.01	0.43	5.58	16.04	34.79
1972/73	5.16	0.38	4.78	16.96	28.17
1973/74	4.77	0.37	4.40	17.12	23.00
1974/75	6.10	0.39	5.70	22.36	25.51
1975/76	7.20	0.44	6.76	25.27	26.73
1976/77	7.84	0.50	7.34	28.76	25.53
1977/78	8.40	0.47	7.93	31.50	25.16
1978/79	10.45	0.62	9.83	34.08	28.85
1979/80	10.85	0.57	10.28	37.57	27.35
1980/81	10.69	0.67	10.02	41.06	24.39
1981/82	13.08	0.72	12.37	45.39	27.25
1982/83	17.99	0.92	17.07	50.62	33.72
1983/84	16.06	1.08	14.99	54.03	27.74
1984/85	16.87	1.01	15.86	56.36	28.16
1985/86	19.30	1.10	18.21	61.10	29.80
1986/87	19.48	1.00	18.48	66.83	27.65
1987/88	17.04	0.97	16.08	71.74	22.41
1988/89	15.91	1.00	14.92	76.97	19.38
1989/90	21.13	1.06	20.08	83.13	24.15
1990/91	24.60	1.22	23.38	87.53	26.71
1991/92	26.48	1.38	25.11	89.19	28.15
1992/93	26.77	1.37	25.40	90.11	28.19
1993/94	23.94	1.24	22.70	91.77	24.73
1994/95	20.99	1.04	19.95	94.60	21.09
1995/96	22.01	1.18	20.83	98.67	21.11
1996/97	22.36	1.15	21.22	100.00	21.22

Note:
1.: Column (4) = Column (2) - Column (3)
2.: Column (5) = Consumer Price Index, ABARE (1997) Table 11
3.: Column (6) = Deflated price using the CPI

Table 3

Production level, value and royalty data,

New South Wales coal industry, 1985 - 1997.

(1) Year	(2) Production volume, Mt	(3) Production value, M$	(4) State royalty M$
1984/85	70.03	1 948.61	106.56
1985/86	77.19	2 299.59	115.44
1986/87	88.51	2 611.74	132.64
1987/88	76.27	2 141.42	94.81
1988/89	81.27	2 559.64	90.89
1989/90	93.89	3 040.90	116.62
1990/91	96.70	3 133.40	136.19
1991/92	101.17	3 935.00	135.18
1992/93	102.91	4 000.00	144.19
1993/94	101.96	3 878.00	149.84
1994/95	108.20	4 187.00	148.39
1995/96	113.00	4 268.00	153.96
1996/97	123.70	4 517.00	168.11

Note:
1.: Columns (2), (3) and (4) from NSW Department of Mineral Resources (1997)

Table 4

Approximating the price of coal,

$/t, based on production value and royalty payments.

(1) Year	(2) Production value, $/t	(3) State royalty, $/t	(4) Nominal approximate price (2) - (3), $/t	(5) CPI	(6) Real price, R, $/t
1984/85	27.82	1.52	26.30	56.36	46.67
1985/86	29.79	1.50	28.30	61.10	46.31
1986/87	29.51	1.50	28.01	66.83	41.91
1987/88	28.08	1.24	26.83	71.74	37.41
1988/89	31.49	1.12	30.38	76.97	39.46
1989/90	32.39	1.24	21.14	83.13	37.47
1990/91	32.40	1.41	31.00	87.53	35.41
1991/92	38.89	1.34	37.56	89.19	42.11
1992/93	38.87	1.40	37.47	90.11	41.48
1993/94	38.04	1.47	36.57	91.77	39.85
1994/95	38.70	1.37	37.32	94.60	39.46
1995/96	37.77	1.36	36.41	98.67	36.90
1996/97	36.52	1.36	35.16	100.00	35.16

Note:
1.: Column (4) = Column (2) - Column (3)
2.: Column (5) = Consumer Price Index, ABARE (1997) Table 11
3.: Column (6) = Deflated price using the CPI

Figure 1
Bilateral monopoly: Form 1

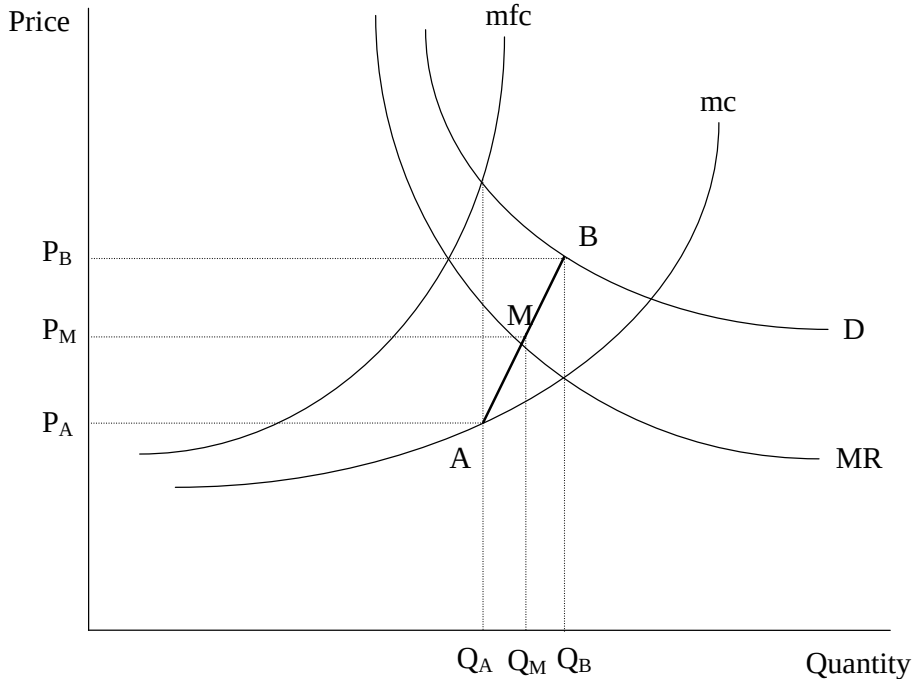

Figure 2
Bilateral monopoly: Form 2

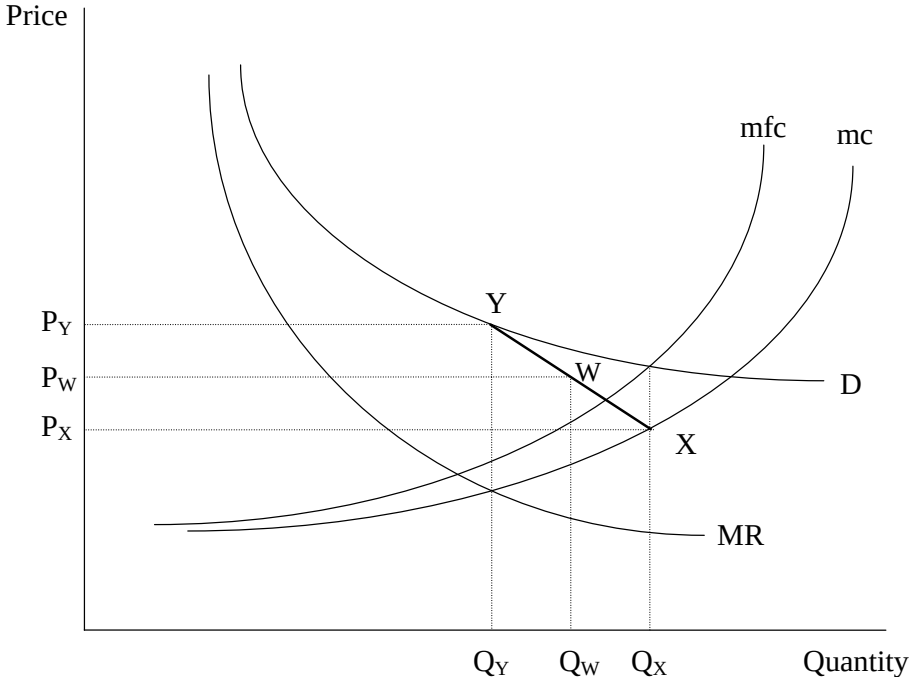

Figure 3
Bilateral monopoly with royalties: Form 1

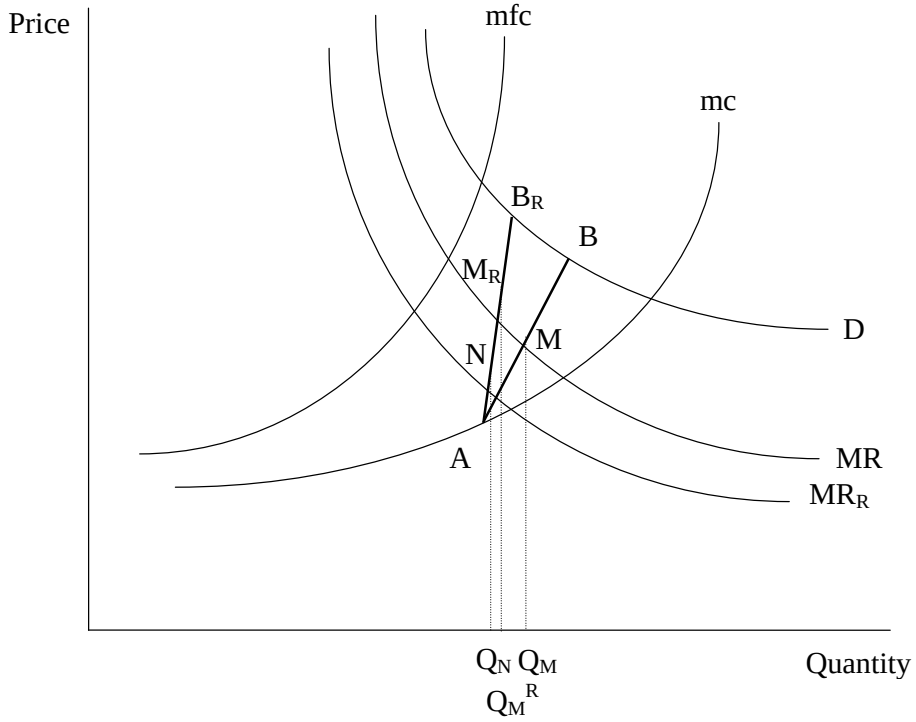

Figure 4
Bilateral monopoly with royalties: Form 2

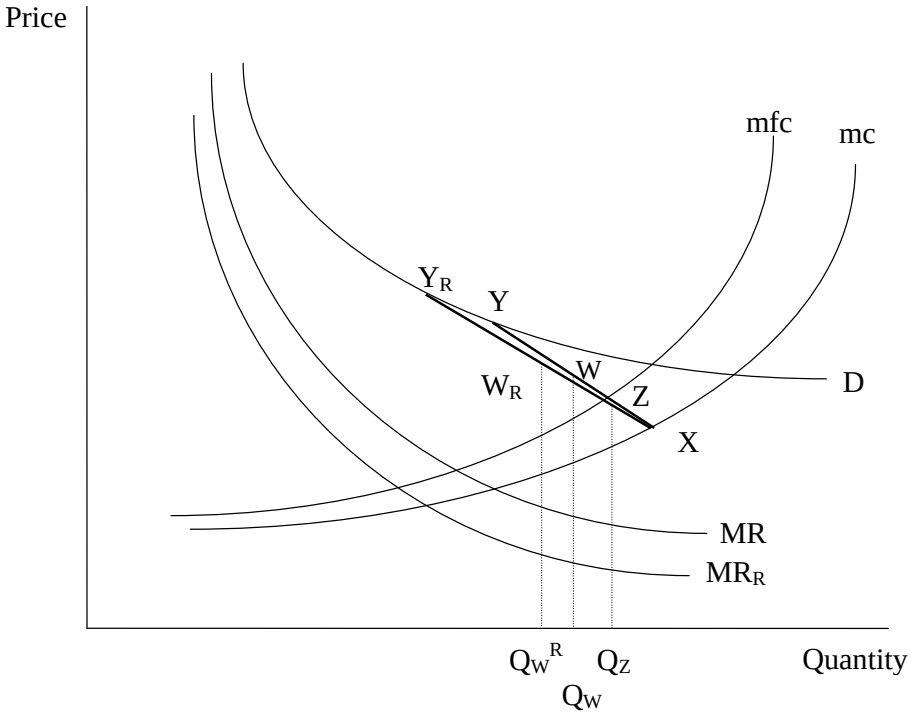

Figure 5
Bilateral monopoly with an increase in demand: Form 1

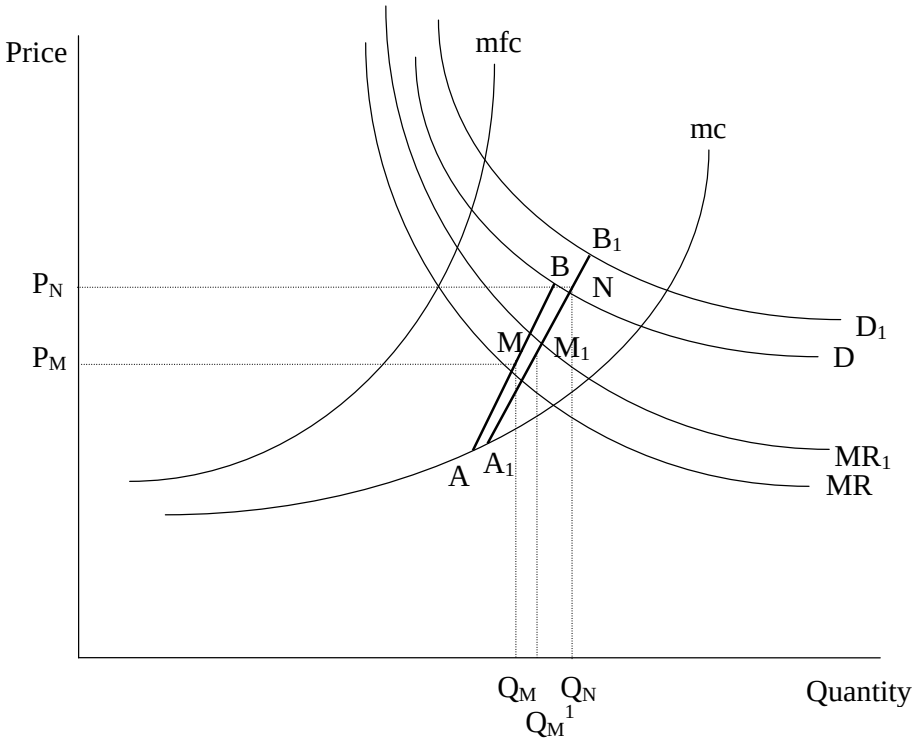

Figure 6
Bilateral monopoly with an increase in demand: Form 2

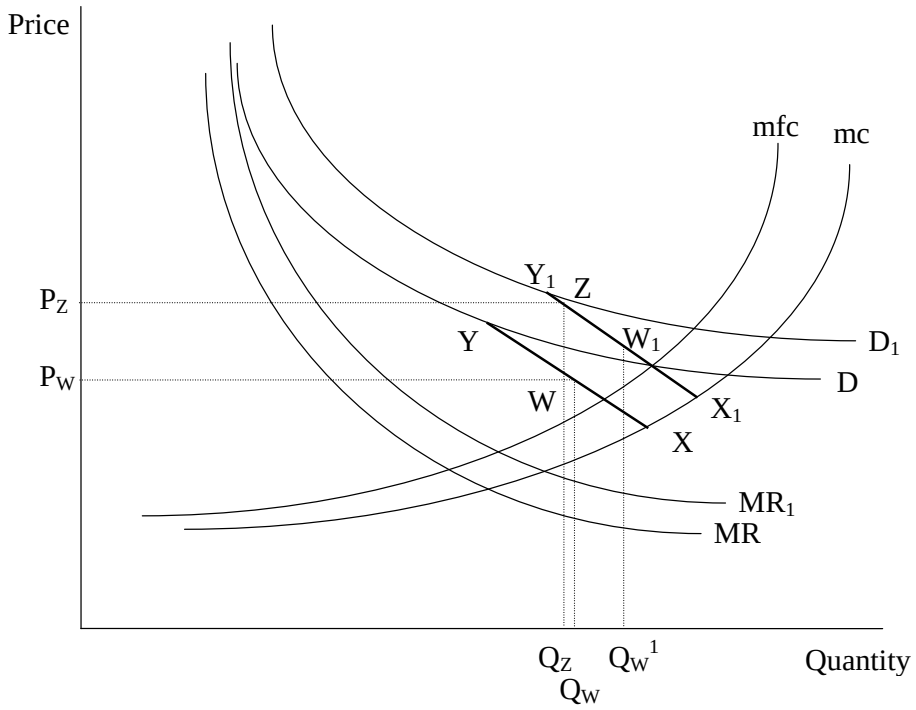

Figure 7
Bilateral monopoly with a decrease in marginal cost: Form 1

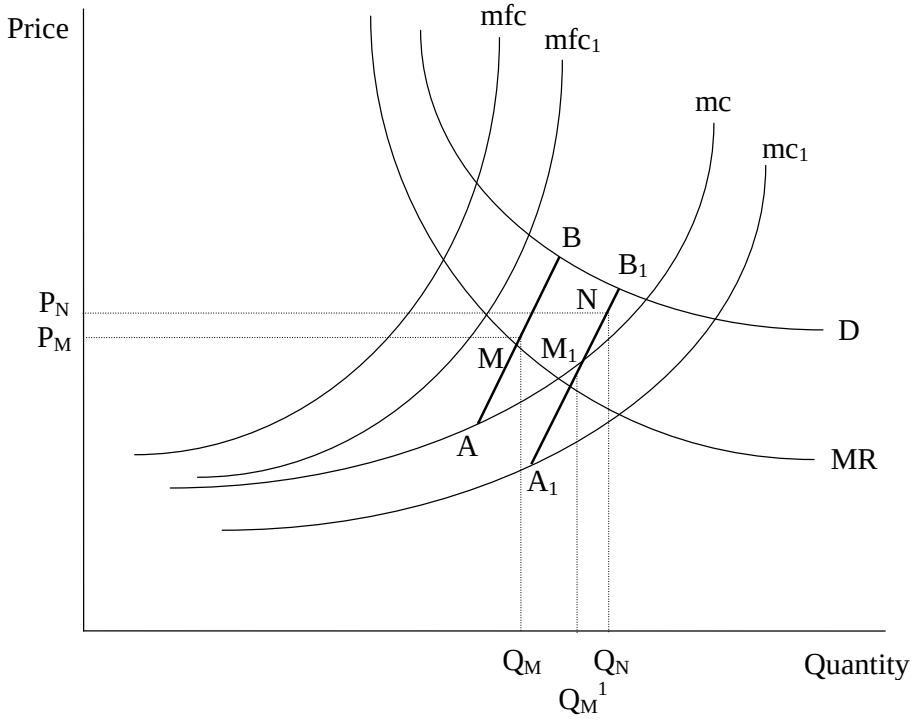

Figure 8
Bilateral monopoly with a decrease in marginal cost: Form 2