

The profitability of flat-price broadband with an over-the-top subscription content product

Research note

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The purpose of this brief analysis is to investigate, using a discrete simulation model, the effect on the broadband market when an over-the-top subscription content product is introduced. Does it necessarily increase or decrease profitability of the broadband product when it (a) boosts the utility of broadband but (b) imposes additional costs to deliver the broadband service. The short answer is: it depends.

We use a toy model with a small number of consumers to show how the outcomes depend on the structure of the consumer valuations to a significant extent. The different scenarios that we chose to illustrate this, demonstrate that in many cases the broadband and content providers can jointly benefit from coordination on how the content product is priced. In the final scenario, this directly benefits consumers as well.

The model

We consider a monopoly broadband provider and a market with ten consumers (labelled 0 to 9). Consumer valuations for a broadband and an over-the-top content product are generated randomly and we select and discuss a number of interesting cases. The random seed used in our Python script is given in parentheses and can be used to duplicate the results using our software but these results can also be manually checked.

Initially, the content service is not available and the broadband provider sets its price so as to maximise profit. It does not change this price when the content subscription option is introduced. In practice, this tends to happen in a market where there is flat and uniform pricing – consumers all pay the same price regardless of how much they use the broadband. Since many consumers do not take up the content product, it is difficult to increase the price of broadband access.

Our broadband provider is assumed to incur a variable cost of \$40 for an ordinary broadband user and \$50 for a user that subscribes to the content product as well. Purchase of the content product is only possible if the broadband product is also taken and a consumer purchases both if the sum of her/his valuations of the two products exceeds the combined prices of the two. The fixed costs of the broadband provider can be ignored in this analysis.

Outcomes are described for three hypothetical situations. First, the monopoly broadband provider sets a price for the broadband product to maximise its profit (labelled 'Broadband only') and the content product is not available (its price is infinite, in other words). Second, the content provider independently prices the content product so as to maximise its revenue (labelled 'Content independent'). This can affect the profitability of the broadband product. Third, the broadband and content providers act in concert (labelled 'Joint effort') to determine a content product price that maximises the producer surplus (the sum of the total broadband profit and total content revenue).

Consumer surplus is, as usual, the sum of the differences between consumer valuations and the price they pay. Total surplus (or, welfare) is the sum of producer and consumer surplus. The scenarios below were chosen by hand from a small number of trial runs of the model.

Scenario 1

The first scenario illustrates the case where broadband profits are dramatically affected by the introduction of the content product.

Consumer valuations (1586964)	0	1	2	3	4	5	6	7	8	9	Average
Broadband	26	33	34	106	85	34	71	55	60	62	56.6
Content	10	8	36	25	2	10	18	6	34	22	17.1

Outcomes	Broadband price	Content price	Broadband profit	Content revenue	Producer surplus	Consumer surplus	Total surplus
Broadband only	60	inf	100	0	100	84	184
Content independent	60	17	60	68	128	115	243
Joint effort	60	22	70	66	136	99	235

Broadband profit drops from 100 to 60 when the content product is introduced and priced at \$17. The content provider's revenue of 68 still makes the producer surplus higher than before and, naturally, consumer surplus increases as well.

It might be fair, in this scenario, for the broadband provider to negotiate with the content provider to compensate it for the loss in profitability. In fact, the content provider would be able to compensate the broadband provider in full for the 40 loss in broadband profit (that is, the additional cost of serving the content provider's subscribers) without affecting the consumer surplus. This would leave the content provider with positive nett revenue of 28. However, if the two providers could agree for the content product to be priced at \$22 then the content provider would have to compensate the broadband provider by only 30 and suffer a decline in content revenue to 66 but still be better off with nett revenue in that case of 36 instead of 28.

Unit sales	Broadband sales	Content sales
Broadband only	5	0
Content independent	5	4
Joint effort	5	3

As expected, the joint effort consumption of the content product is lower than in the free-riding ('Content independent') case and consumer surplus is decreased by lower sales as well as by the increase in price of the content product. Introduction of the content product does not increase the number of broadband subscribers in this scenario. A regulator that would apply the consumer welfare standard to judge a merger between broadband and content provider in this scenario, might decide to disallow it on that basis.

Scenario 2

The second scenario illustrates the case where adding the content product is simply of benefit to all parties and there is no room for improvement through negotiation between the providers about the pricing of the content.

Consumer valuations (9482776)	0	1	2	3	4	5	6	7	8	9	Average
Broadband	69	44	48	46	64	96	67	42	20	37	53.3
Content	6	1	34	9	26	11	2	20	12	37	15.8

Outcomes	Broadband price	Content price	Broadband profit	Content revenue	Producer surplus	Consumer surplus	Total surplus
Broadband only	64	inf	96	0	96	40	136
Content independent	64	10	104	40	144	65	209
Joint effort	64	10	104	40	144	65	209

For this consumer valuation structure, introduction of the content product at a low price increases the profit of the broadband provider through increasing the number of broadband subscribers. It would be impossible for the content provider to compensate the broadband provider in full for the cost that its subscribers impose (as that would completely exhaust its revenue) but there would not necessarily be an immediate need for this as the products are complementary.

Unit sales	Broadband sales	Content sales
Broadband only	4	0
Content independent	6	4
Joint effort	6	4

Broadband sales jump by 50% when the content product is introduced. A regulator that would apply the consumer welfare standard to judge a merger between broadband and content provider in this scenario, should decide to allow it on that basis.

Scenario 3

In the third scenario, introduction of the content product at a high price reduces the broadband profit. However, the broadband provider would have an incentive to negotiate with the content provider to reduce the content price to a level where it induces an increase in the uptake of broadband.

Consumer valuations (3176136)	0	1	2	3	4	5	6	7	8	9	Average
Broadband	99	41	106	59	62	6	46	37	50	86	59.2
Content	13	39	33	5	39	22	23	10	36	28	24.8

Outcomes	Broadband price	Content price	Broadband profit	Content revenue	Producer surplus	Consumer surplus	Total surplus
Broadband only	86	inf	138	0	138	33	171
Content independent	86	28	118	56	174	38	212
Joint effort	86	15	154	45	199	64	263

Here, as in the first scenario, content revenue allows for compensating the broadband provider for the 20 drop in profit caused by content subscribers, leaving the content provider with positive revenue. This is, again, simply the broadband provider's additional cost for serving the 2 subscribers to the content.

However, if the broadband provider, could induce the content provider to lower its price to 15, an increase in broadband uptake would increase its profit by 16 to 154 (from the 'Broadband only' base case) which would allow it to compensate the content provider (in part) for its loss of 11 in revenue (from 56 to 45). Not only does a negotiated position ('Joint effort') improve producer surplus, it also increases consumer surplus substantially in this scenario (from 38 to 64).

Unit sales	Broadband sales	Content sales
Broadband only	3	0
Content independent	3	2
Joint effort	4	3

The negotiated position in this scenario increases the uptake of both the broadband and the content product. This scenario has a high broadband price and consequently low uptake and in future work, we shall explore the possibility of optimising the broadband and the content price simultaneously. A regulator that would apply the consumer welfare standard to judge a merger between broadband and content provider in this scenario, should unequivocally decide to allow it on that basis.

Discussion

The three scenarios discussed above show that very different outcomes are possible for a broadband provider when a subscription content product is introduced. The difference lies in the specific structure (and not just average values) of the customer valuations. Naturally, these can be regarded as rough but nevertheless illustrative examples of what may arise in practice. Even without following the details, the reader's common sense should suggest quite strongly that when the revenue from the content product is not significantly greater than the incremental cost it imposes on the broadband provider (scenario 2) then only an increase in broadband uptake can rescue the profitability of the latter. But even with a high content price (scenario 3), the uptake of broadband can fail to grow and hence the impact on the profitability of broadband provision is strictly negative. Scenario 3 also illustrates that the price charged to maximise the content provider's revenue is not necessarily the one that optimises total surplus.

We have not mentioned how the random customer valuations were generated. At this stage in the analysis we have not been attempting to determine what a typical case is, but rather exploring the range of possible scenarios which can arise. Incidentally, we used a uniform distribution which allowed us to easily generate a diverse range of outcomes for 10 consumers. Similar outcomes can be generated for 100 (or more) consumers but for large number of consumers, the outcomes will tend to reflect the assumption about the distribution – which we are agnostic about. A small number of consumers (10 or 100, say) can be taken to reflect different consumer segments. It is a well-known approach in marketing (if not in economic modelling) to consider discrete segments of the target audience and we believe that here, as in our past work, considerable insight can be gained by this.