The 'waterbed effect' in mobile telephony

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INTERNATIONAL

Abstract

Termination charges are the prices that mobile networks charge other networks for connecting calls to their subscribers. Regulation of mobile termination charges is becoming increasingly prevalent around the world and it is important that all the effects of the regulation are identified and assessed. One of the key issues is understanding the nature of the ‘waterbed effect’—the tendency for changes in mobile termination charges to alter the prices of other mobile services. This Discussion Paper provides a guide to one of the economic reasons why changes in mobile termination rates can be expected to have an impact on retail mobile prices.

Introduction

This Discussion Paper examines the impact of regulatory intervention to lower ‘mobile termination’ charges on the level of prices for mobile subscribers. We explain the nature of the ‘waterbed effect’ (the tendency for competition for mobile subscribers to eliminate rents earned from termination charges) and that lower termination charges will necessarily result in higher prices for mobile subscribers, regardless of whether competition at the retail level is fully effective. This has implications for the assessment of consumer benefits from mobile termination regulation.

Termination charges are what mobile networks charge other networks for connecting calls to their subscribers. They are wholesale charges that are paid by the network (fixed or mobile) of the person calling the mobile subscriber, not by the mobile subscriber. Regulation of mobile termination charges is becoming increasingly prevalent around the world and it is important that all the effects of the regulation are identified and assessed.

Traditional monopoly regulation is largely concerned with setting prices in line with some measure of costs, and regulation of mobile termination charges is no exception. However, the nature of mobile termination is different to the types of monopolies that have generally been the focus of regulation. In particular, mobile termination regulation has effects that go beyond addressing issues of alleged market power in mobile termination. As discussed in this paper, reducing the level of termination charges will increase the level of prices for mobile subscribers (i.e. higher prices for calls from a mobile, for subscription and for handsets). This has been called the ‘waterbed effect’.[1] The extent to which the ‘waterbed effect’ occurs will depend on the nature of competition in relation to retail mobile services as well as the shapes of the underlying demand and cost curves. Significantly, prices for mobile subscribers will be affected whether or not retail mobile services are subject to effective competition, although the more competitive the market, the greater the extent of the ‘waterbed effect’. It follows that regulatory intervention in the area of mobile termination rates should take into account the impact on mobile subscribers as well as on callers to mobile phones. Regulators will need to carefully balance these offsetting effects to assess whether controls on mobile termination charges will raise or lower overall consumer benefits.

This Discussion Paper provides a guide to one of the theoretical reasons why changes in mobile termination rates can be expected to have an impact on retail mobile prices. Understanding the ‘waterbed effect’ is critical to assessing whether mobile termination charge controls will benefit consumers overall. If termination charge controls force up mobile retail prices then regulators will need to weigh the costs to mobile subscribers against expected benefits to callers to mobiles to be able to determine the overall impact on consumers. The greater the extent of the ‘waterbed effect’, the more likely it will be that mobile termination regulation results in little overall benefit to consumers or, worse, comes at an overall cost to consumers.

The theoretical underpinning of the ‘waterbed effect’

Mobile operators compete to win subscribers, who then provide a stream of revenues. They compete by offering attractive prices for outbound mobile calls and subscription and, in the case of post pay customers in particular, attractive handset offers. In doing so they will take into account all of the revenues that will result from acquiring a customer and equally all of the costs of servicing that customer. Part of these revenues will come from the termination revenues that flow from people calling the subscriber. When considering its pricing policy, a mobile operator will take these termination revenues into account. The higher an operator expects these to be, the less it will be prepared to charge for outbound calling

and handsets. This is because lowering subscriber prices increases the level of subscriptions as the service becomes cheaper, which in turn increases the termination revenues earned.[2] It follows from this that if termination charges and hence revenues rise,[3] then operators will be willing to lower outbound prices in order to win additional subscribers. The reverse is also true: if termination charges and revenues fall, operators will raise their prices to subscribers. Of course the important question is: by how much?

Competition

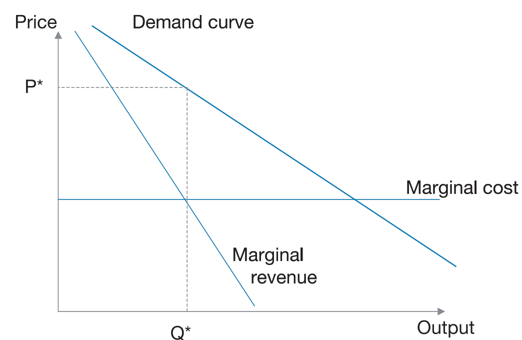
In our experience regulators generally accept that the ‘waterbed effect’ will be complete when competition for subscribers is sufficiently strong to ensure that no operator is able to make excess economic profits. Consider the effect of an increase in termination charges in this situation. This would increase the level of termination revenues associated with each subscriber, tending to make subscribers more valuable to acquire for the mobile operators. However, in competing to acquire the more valuable subscribers, operators would now have the incentive and ability to reduce prices to subscribers to attract them to their own networks. The final result would be a complete ‘waterbed effect’ in the sense that changes in termination prices would change outbound prices in such a way that economic profits remained zero. In this market, regulation of termination charges would affect the structure of prices, but not overall profitability. It would imply that some consumers were better off (those who make many calls to mobile phones but make few calls from mobile phones), but that others were worse off (those who make few calls to mobile phones but make many calls from mobile phones). The profits of the operators would be unaffected by changes in the level of termination charges.

While competition does appear strong in many mobile markets, some regulators (including those in Australia and the UK) have indicated that they believe there remains the potential for individual mobile operators in their markets to be earning excess profits. Given this view, there is a need to consider the nature of the ‘waterbed effect’ when competition is not perfect. We will start with the case of monopoly since this provides a limiting case at the other end of the spectrum from perfect competition. We will then consider oligopolistic market structures.

Monopoly

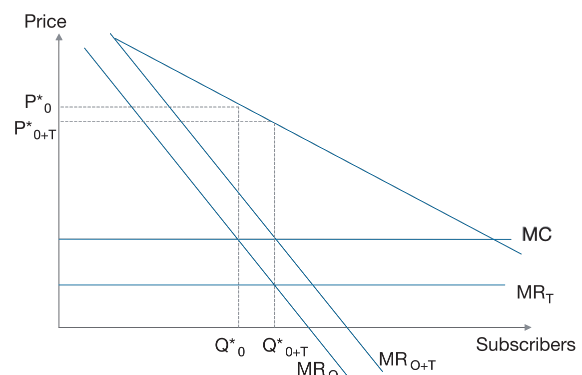
Standard economic theory tells us that a monopolist, as with any firm, will price at the point at which marginal revenue equals marginal cost. Marginal revenue is the extra revenue the monopolist earns from selling his last (marginal) unit. While a monopolist may be able to sell a limited number of units at a high price, selling additional units will require lowering its overall price. This will generate additional revenue from the additional units sold, but will also reduce the revenue earned on all the other (non-marginal) units that are sold.[4] Marginal revenue is therefore always less than the price. Marginal cost is the extra cost incurred by selling one more unit of a product. When marginal revenue is above marginal cost, it pays the monopolist to sell more units of output, since it earns more on these units than it costs to produce them. Conversely, when marginal revenue is below marginal cost, it pays the monopolist to sell less output since it is losing money on the marginal units. Equilibrium occurs where marginal cost and marginal revenue are equal. This is shown in Figure 1. The monopolist sells Q* and charges P*.

Figure 1: Standard monopoly outcome



With minor alterations, we can explore the effect of changes in termination charges on outbound prices. Suppose we replace ‘output’ with ‘subscribers’ and make ‘price’ the bundle of relevant prices charged to mobile subscribers as in Figure 2. The demand curve then relates the numbers of mobile subscribers to the ‘price’ of being a mobile subscriber. The marginal revenue curve denoted MR_O (marginal revenue outbound) is the marginal revenue earned by the monopolist directly from mobile subscribers. This means that it omits the termination revenues that result from having subscribers on its network.

Figure 2: A monopolist of mobile telephony



Assume for simplicity that each subscriber generates the same amount of termination revenue. MR_T is then the marginal revenue from termination, and MR_{O+T} is the sum of the two marginal revenue curves. We can now see that by taking into account termination revenue, the result is that the monopolist charges a lower outbound price (P^*_{O+T}) than if the termination revenues were to be ignored or, equivalently, were zero (P^*_O). The implication of this is clear: if termination charges are lowered and so termination revenues fall towards zero, then a monopolist would set higher prices on the outbound side. This results from the (standard) assumption that the firm sets prices to maximise its overall profits. So even in the extreme case of a monopoly mobile operator earning the maximum economic profits able to be earned from the market, it is not reasonable to argue that reductions in termination charges will have no effect on the prices for retail mobile services.

Oligopoly

Many mobile markets are characterised by a small numbers of players. For instance, most European countries have between three and five mobile operators at present (a few have only two). While we have shown that there will be some ‘waterbed effect’ even under monopoly, the next question to ask is what would be the extent of the ‘waterbed effect’ in the case of a market with a limited number of players, if that meant that the market was less than ‘fully competitive’?[5]

The short answer is that it varies depending on the nature of competition in relation to retail mobile services as well as the shapes of the underlying demand and cost curves. However, the outcome will lie between the competitive and monopoly outcomes described above.[6] The better the operators are at coordinating, the closer the outcome will be to the monopoly outcome, and the more price rebalancing will be driven by the complementary nature of termination and subscription prices rather than by competition between the operators. On the other hand, a market with strong, albeit not perfect, competition would be expected to lead to close to a full ‘waterbed effect’. In either case some rebalancing will occur.

Conclusion

The existence and magnitude of the ‘waterbed effect’ following the regulation of termination rates is key to understanding the social costs and benefits of the regulation of mobile termination rates. Regulators generally accept that the ‘waterbed effect’ is likely under a fully competitive market, however, some have taken the view that imperfect competition implies there may not be reason to expect a ‘waterbed effect’ in practice. Rather, termination prices and revenues can be dealt with independently of the broader mobile services (subscriber) market. However, this is not the case. Whether the subscriber market is fully competitive or entirely monopolised there will be price interactions, and it is clear that lowering termination rates will in each case lead to retail prices being higher than they would be in the absence of regulation. The likelihood of an impact on retail mobile prices has a number of implications. First, the impact on mobile subscribers should be taken into account in assessing the overall costs and benefits to consumers of the regulation. Further, the impact on retail mobile prices may also lead to longer term dynamic effects that have not generally been taken into account. Higher prices for mobile subscribers are likely to weaken the ability of mobile services to act as competitive constraints on the supply of fixed services. Competition from mobile services could play an important role in stimulating fixed incumbents to offer more competitive and innovative services, particularly given the limited ability of fixed competitors to provide alternative access networks. In this respect, mobile termination regulation has implications that go well beyond the narrow concern of addressing the alleged ‘termination monopoly’.

Notes

1 The ‘waterbed effect’ was the name used during the UK Competition Commission inquiry into the impact of changes in mobile termination charges on prices to mobile subscribers. The ‘waterbed effect’ is a consequence of the services being offered in a two-sided market. A general introduction to the economic theory on two-sided markets is provided in J. Rochet and J. Tirole, “Two-Sided Markets: An Overview”, *IDEI Working Papers 275*, Institut d'Économie Industrielle, Toulouse, 2004.

2 Mobile termination is therefore an economic complement to subscription. Lowering subscription prices increases the demand for termination. However the relationship is asymmetric and the reverse is not true: there is good evidence that lowering termination charges does not significantly increase demand for subscription.

3 We assume throughout that the elasticity of demand for termination is less than one (in absolute terms), so increases in charges increase revenues and reductions in charges reduce revenues. This is a reasonable assumption to make as both common sense and empirical observation strongly suggest that termination is a very inelastic service.

4 We are assuming, for now, that the monopolist does not price discriminate between customers.

5 We note that we make this assumption for the purposes of this discussion. The authors of this paper do not hold the view that the observation of five or fewer players in mobile markets in any way suggests these markets are less than fully competitive.

6 Economic models of oligopoly tend to assume either Bertrand (price) or Cournot (quantity) based competition. Models with price based competition tend to produce more competitive outcomes and so are likely to imply greater rebalancing than models of quantity competition. However, the fact that rebalancing will occur, and the direction of change, will be in line with the monopoly case: lowering marginal revenue by lowering termination charges will increase optimal subscriber prices.

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