

Non Technical Summary of “Opportunism in the presence of an essential facility” by Chris Doyle, London Business School. To be presented to TPRC, October 1996.

An essential facility is an input in a production process that is necessary to enable an output to be produced, but need not be owned exclusively by an individual firm. Essential facilities are prevalent in network industries. Examples of essential facilities include ports, rail termini, local telephone exchanges, gas distribution networks, *etc.* Investments that are complementary to essential facilities, such as ships in the case of ports, rolling stock in the case of rail termini, fibre optic and microwave networks in the case of local telephone exchanges, may have specific features giving rise to opportunistic behaviour.

Opportunism is more likely if an essential facility is owned by a firm which is distinct from a firm investing in a complementary input, and where a complementary input involves some irrevocable cost. The following hypothetical example illustrates the point. Suppose that firm *A* owns an essential facility giving it direct access to consumers: the firm could be an electricity distributor, a local telecommunications company, a television broadcaster, *etc.* Firm *A* can choose to supply itself with the services it distributes to consumers, or alternatively it could choose to purchase the services from another firm *B*. (In other words firm *A* is vertically integrated whereas firm *B* is separated from the essential facility.) An electricity distributor could generate electricity itself or it could purchase power from another generator; a telecommunications firm could supply customers a range of services it produces, or alternatively it could purchase specialised services from service providers; a television broadcaster could produce programming internally or it could buy these from specialised production companies. In all of these cases firm *B* is dependent on firm *A* for access to the market — the market is not contestable. When firm *A* chooses to purchase services from firm *B*, and as a consequence firm *B* invests in specific capital to produce these services, the possibility for hold-up naturally arises. As each firm knows this, and in particular as they each know they know this, there may be a tendency for firm *B* to under-invest. This is clearly socially undesirable if firm *B* is more cost efficient at producing services.

In this paper the effects of opportunism within the context of an industry in which one firm owns an essential facility are examined. The market structure studied in the paper exhibits what we term *unilateral dependency*: firm *B* is dependent on firm *A* for sales, but firm *A* does not depend on firm *B* for sales. It is useful to think of firm *A* as having ‘access’ to the market and firm *B* being ‘blocked’ from the market. Unilateral dependency characterises many markets and is primarily due to three factors: (i) legal restrictions, (ii) natural monopoly

conditions and (iii) historical legacy. For example, in the UK gas and electricity markets, historically at least, producers and generators can only sell output to small customers via essential facilities owned by separate distribution firms. In television broadcasting, independent programme makers without access to spectrum can only sell their outputs to consumers via broadcasting companies.

In the paper a model is constructed to examine the problem of opportunism in the presence of an essential facility. The structure of the model captures the following moves: A first stage where each firm A and B decides how much capacity to install (the investment decision), a second stage in which production takes place, and a final stage where firm A determines how much output is brought to the market. In the final stage the firms bargain over the division of any revenue associated with the sale of any output by firm B to firm A . The cost of investment by each firm in stage one is irrevocable.

A solution is constructed for the model using conventional game theoretical tools. It is shown that opportunism is practised by both firms. Firm A is opportunistic with regard to firm B in the classic sense: once firm B has sunk its investment firm A subsequently ignores this when maximising profit. Although firm B also ignores its investment cost once it has been undertaken, it nevertheless takes into account firm A 's opportunistic behaviour when choosing its investment level. However, firm B may also act in an opportunistic fashion. This arises because firm A cannot commit in stage one to purchase certain levels of output from firm B in stage three. This leads firm B , in some cases, to choose a capacity above the amount that firm A *ex ante* would prefer firm B to select. As a consequence firm A correspondingly lowers its investment. The net effect may or may not be socially beneficial. It is shown that opportunism by firm B can, somewhat paradoxically, help to reestablish firm A 's monopoly power. Nevertheless firm B 's opportunism can have a countervailing effect on welfare.

Having illustrated the existence and nature of an equilibrium in a general setting, a linear example is examined in detail. Necessary conditions delineating different qualitative forms of the equilibria in terms of underlying parameters (marginal investment costs) are derived and shown diagrammatically. The focus in the linear example is on output, welfare (where welfare is defined as consumer surplus plus industry profit) and to a lesser extent on the distribution of profits across the two firms. How all of these vary in terms of the underlying parameters is also discussed. When firm A 's costs are relatively low it may produce all of the output brought to the market. A necessary condition for firm B to produce in equilibrium is that its marginal cost of installing capacity lies below that of firm A . When both firms produce output in equilibrium it is shown that total output can lie above that which would be chosen by firm A if it were a monopolist. In this case firm B 's opportunistic behaviour has a favourable impact on welfare,

but opportunism by firm A results in it obtaining profit exceeding the monopoly profit associated with its cost function.

It is also shown in the linear case that where a price-cap is imposed welfare may decline in the maximum price permitted. If a price-cap results in total output lying above the quantity which would be delivered to the market in its absence, as would seem sensible, it may lead firm B to withdraw entirely from investment. This could arise because a price-cap, by lowering the equilibrium price, when combined with firm A 's opportunism may result in firm B obtaining a negative profit if it invested in capacity. Given that firm A faces a higher marginal cost for investment in capacity, this inevitably increases the total cost of production and consequently total profit will lie below the monopoly level associated with firm A 's marginal cost. It is conceivable that the gain in consumer welfare due to a price-cap is offset by the reduction in producer welfare (profit) due to the low cost producer falling out of the market.

Various extensions are considered within the linear framework, such as the case where firm A acts as a (Stackelberg) leader — taking into account firm B 's reactions to its own decisions. Here it is possible for welfare to lie above that in the comparable non-Stackelberg case; however, if this is the case consumer welfare is unambiguously lower. Higher welfare may arise in a Stackelberg setting due to a shift in production towards the lower cost producer. Firm A reduces its investment so as to make investment more attractive for firm B (due to a higher market price). Firm A resists increasing investment knowing that *ex post* this is undesirable. Welfare is higher whenever the profit gain to firm A exceeds the deadweight loss associated with a higher market price.

A brief discussion is also presented on foreclosure. Foreclosure is regarded as a situation where a firm aims to reestablish monopoly power. The analysis is modified, in a loose sense, by supposing that at the beginning of stage one firm A can increase or decrease its rival's (firm B) marginal investment cost by some small amount. It is suggested that where this is feasible there are parameter values where firm A has an incentive to lower firm B 's marginal cost, and other parameter values where firm A would wish to increase firm B 's marginal investment cost. For example, for certain parameter values only firm A produces, but if firm B 's marginal cost were slightly lower firm B would be able to make a positive profit, and furthermore, firm A 's profits would be higher. This effect may seem peculiar but it is intuitive: at any given price a unit of output delivered by firm B to firm A gives a marginal revenue equal to half the price (due to bargaining) and this may exceed firm A 's price-cost mark-up. Furthermore, the net effect on equilibrium output is positive. Foreclosure in this opportunistic setting can be associated with higher consumer welfare and higher total welfare, and the extension of firm A 's monopoly power leads to a redistribution in profit away from firm B . Alternatively

foreclosure may take the usual form: an incentive to increase the rivals' cost.

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