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Network Externalities and Competition Policy. Comments on Koski and Kretschmer

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Abstract. Although network effects are of great policy relevance, the literature does not provide very clear guidance to policymakers. As a rough first step, a simple ''algorithm'' for competition policy is proposed.

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1. Introduction

This paper is both timely and useful. It is timely because the literature has seen significant developments since the last ''wave'' of surveys in the 1990s. These developments have been mostly on the empirical side, which is Koski and Kretschmer's focus. Moreover, network issues are receiving increasing attention in policy circles. This is certainly true of competition policy where network effects have been at the center of high profile cases such as the Microsoft saga and the twin WorldCom/MCI/Sprint cases. The paper is also useful because it gives us an honest snapshot of the literature on network issues. Like all good surveys, it also makes us think about the current state of the field. The picture is highly contrasting and is not necessarily flattering.

On the theoretical side, we can definitely say that we are in the ''mature'' phase. Although there still are interesting new papers looking at specific institutional settings, the main economic mechanisms involved in the network industries were identified a long time ago. As Koski and Kretschmer point out, this theoretical literature has interesting implications for the design of firms' strategies. In fact, the impact of the network externality/compatibility literature on strategic management has been significant as it has found its way into courses on the management of technology, business school cases and consulting practice. The theory has also been bandied about in policy circles, both in matters of innovation policy and in the domain of antitrust. So far, this involvement has not been a resounding success. One reason for this is that the theory of networks yields few unambiguous conclusions. Installed bases can lead to excessive inertia or momentum, private firms' incentives to adopt a common standard can be socially excessive or insufficient and most results critically depend upon the nature of consumers' expectations. While ''it all depends'' is a very profitable rule for the consulting side of our profession, it does not provide much useful guidance to policymakers.

To enhance the policy relevance of the economics of network industries calls for two complementary approaches. First, there is a need for ''unifying'' models. The point here is not to obtain completely robust conclusions—we cannot—but rather to assess which

effects are more likely to dominate. Good examples of this approach can be found in Farrell and Katz (1998, 2003). Second, there is a continual need for empirical techniques to measure the respective size of the effects involved and help to resolve whatever theoretical indeterminacy remains.

2. A competition policy ''algorithm''

On a more modest level, it is also important to discuss how policymakers should proceed when they suspect that significant network effects might be present. In this comment, I will briefly outline such an ''algorithm'' from the point of view of competition policy. Before proceeding, however, one must first ask why antitrust authorities should care. There are two main reasons to be concerned.[1] First, in the presence of network ''externalities'', current market shares might be a poor guide to judge the eventual concentration of the industry. As small advantages might lead to market ''tipping'', competition authorities might, for example, want to be rather more severe in their assessments of the potential anti-competitive impact of mergers. Another implication of the potential ''tippiness'' of network markets is that exclusive conducts might be a legitimate concern at lower market share ''thresholds'' than in other industries. The second implication of network externalities is that they tend to provide significant incumbency advantages, as installed customer bases matter both directly and through their potential effect on expectation formation. As access to installed bases and expectations can be manipulated through a variety of conducts, antitrust authorities might have to be especially aware of potential abuses of dominant positions.

These concerns arise irrespective of the precise source of network effects. However, it is hard to imagine how competition policy could be implemented without distinguishing at the outset between different types of network mechanisms. For our purpose two broad categories will suffice. *Indirect network externalities* proceed from the provision of goods that are complements to a given ''platform''. This is the hardware/software framework popularized by Church and Gandal (1992) and Chou and Shy (1990). The main point is that, as agents care about accessing a broad variety of complementary goods, platforms that can support a large array of such goods are at a significant advantage. The second category is that of communication or ''social'' networks, where customers care explicitly about being linked to one another. It is useful to consider two sub-sections within each of these two categories. Under the ''indirect network externalities'' headline, one finds situations such as the PC/OS/software or the video console/games, where each consumer owns her own piece of ''hardware'' but also situations such as satellite pay-TV, where consumers are linked to the same hardware (*e.g.*, the satellites). The same distinction can

1 I focus on how network externalities can affect the relative performance of firms as this is the channel through which they affect market structure. I do not therefore consider how network externalities affects the growth of the industry itself. I do not either consider the details of how network effects—and therefore compatibility and access decisions—affect pricing.

be made within the ''social network category'': members of a telecommunication or transportation network are linked through physical assets, while people sharing a common language or sharing goods (*e.g.*, video games) are not physically attached. As we will see below the main difference that arises from the existence of a shared physical link is that both the extent of network effects and the type of remedies that can be contemplated are affected by the possible congestion of the shared link.

As shown in Figure 1, the first stage of the competition policy algorithm consists of deciding whether network effects are indeed a potential source of concern in the industry under consideration. One must clearly begin by identifying plausible mechanisms through which network effects might arise. A simple notion that ''the more consumers purchase a given product, the more likely other consumers are to follow suite'' is not enough. Such a crude approach would mistakenly label other mechanisms such as reputation-building, learning by doing[2] or information cascades as ''network effects''. Some reasonable story about complementary goods or social networks must therefore be found.

The next step entails assessing the state of ''compatibility'' in the industry. The meaning of ''compatibility'' depends on the mechanism involved. With indirect networks, it simply means that complementary goods are not specific to a particular type of ''hardware''. With social network, compatibility implies that any pair of customers can be linked and that the quality of the link does not depend on the ''technology'' used by each member of the pair. In both cases, a significant lack of compatibility is a sufficient condition for further investigation. This does not mean that observing compatibility suffices to dismiss any concern. If industrywide compatibility results from the licensing of the dominant technology, competition would of course be affected by the terms of the licensing agreement. In that sense, network effects remain relevant since the size of the network externalities would affect the price at which competitors can gain access to the dominant technology.[3] Hence, concerns about possible network effects should only be dismissed at this stage if all (or most) firms can access the dominant technology on reasonably equal terms.

The next consideration is that an apparent lack of compatibility or access can be (partially) alleviated by the behavior of network members and/or the decisions of complementary goods providers. In ''social network'' industries, consumers can often avoid the disadvantages of incompatibility by ''buying'' into several networks.[4] If the proportion of ''double purchasers'' is large, the significance of network effects would be much reduced. In indirect networks, the consequences of incompatibility can be similarly minimized if suppliers of complementary goods find it profitable to offer a version of

2 As noted by the authors, provided that one allows for the same type of consumer expectations in both cases, learning by doing can also result in bandwagon effects.

3 Note that the sign of this effect is *a priori* ambiguous. In the growth phase of the industry, the success of the technology can be improved by granting cheap access. On the other hand, if the owner of the technology has a significant head-start and the technology is well established, the incumbent might have an incentive to charge high access prices.

4 See DePalma et al. (1999) for examples and a formal model.

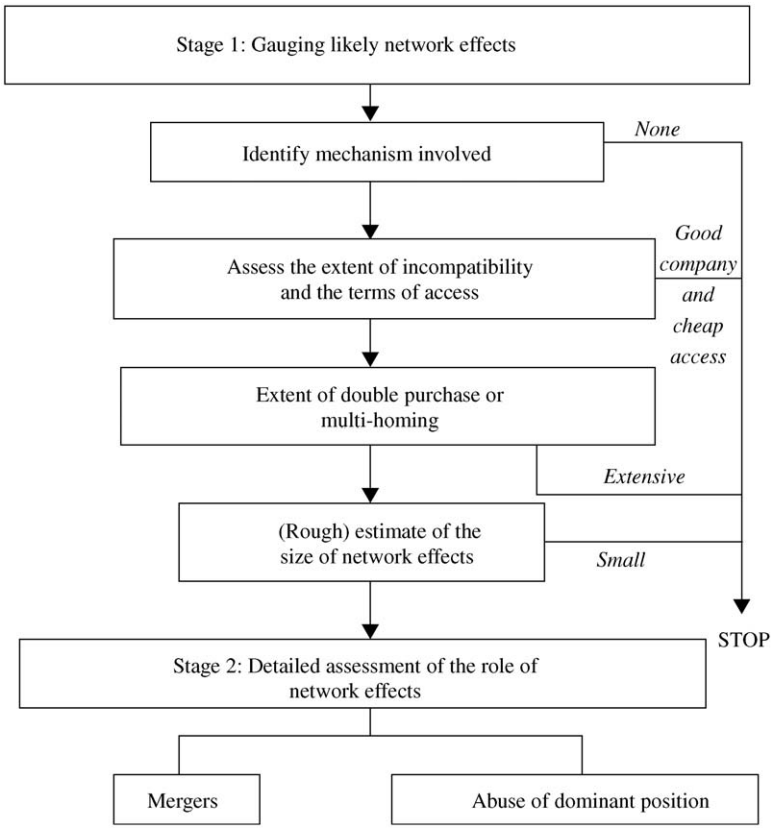

Figure 1. Two stages of competition policy algorithm.

their products for each of the competing platforms.[5] As Koski and Kretschmer point out, this is now the current practice in the video game industry. Similarly, the importance of ''multi-homing'' was discussed in the WorldCom/MCI/Sprint cases.[6]

If one reaches Step 4, it is now likely that the industry does indeed exhibit some network effects and it becomes important to obtain an idea of their strength. This issue can only be resolved by empirical work. As mentioned by Koski and Kretschmer (p. 3), the empirical approaches differ depending on the network mechanism involved. While the strength of ''social'' network effect might be roughly assessed by testing for the importance of installed bases on prices, the appraisal of indirect network effects requires the specification of a set of demand equations as in Gandal et al. (2000). It is worth emphasizing though, that even accurate measurements of network effects only give us a

5 See Doganoglou and Wright (2003) for a formal analysis of such ''multi-homing''.

6 See Doganoglou and Wright (2003) for a formal model of multi-homing. Crémer et al. (2000) also consider the effect of multi-homing on the optimality of ''interface degradation'' strategies.

very approximate idea of their competitive impact as this will also depend both on the (potential) size of the market and on the nature of competition. The kind of empirical approaches currently available must therefore be seen only as convenient tools that help screen cases worthy of further analysis.

If the case under review is thought likely to involve significant network effects, the competition authority proceeds to the second stage of the policy algorithm, where the issue under investigation is now examined in detail. For merger reviews, network effects raise two related concerns. First, as mentioned above, a sudden increase in the joint market share of the merging parties might by itself lead to further improvements in their relative position. Hence market shares that would otherwise look ''reasonable'' might indeed lead to an unacceptable concentration of market power.[7] There are therefore grounds for a stricter policy than in industries without network effect. Such a tough stance would take the form of rejecting mergers at lower market share thresholds and/or of imposing remedies that ensure sufficient compatibility as well as economical access. One should however realize that the theoretical basis for ''market tipping'' is not as solid as it might look. We know, for example, that the dynamic behavior of market shares depends on the type of expectations held by consumers. We know very little about these, suggesting that careful experimental work would be very helpful. Furthermore, models based on network externalities might not accurately capture the dynamics of social networks. In fact, the emerging literature on endogenous network formation suggests that the dynamics can be quite sensitive to exactly how networks are formed.[8]

As exemplified by the WorldCom/MCI/Sprint cases, mergers can also raise concerns about future conduct. In particular, Crémer et al. (2000) have shown that, as the market share of the dominant firm increases (through merger), so do its incentives to decrease the quality of its interconnection with rivals. Since monitoring such conduct *ex post* might be difficult, this is a further argument for being cautious in approving mergers in some network industries.

The full set of anti-competitive conducts that might prove to be (more) profitable in the presence of network effects is too large to be reviewed here. Moreover, the type of conducts most likely to arise depends on the precise network mechanism involved. I will therefore limit myself to two examples. In the presence of indirect network effects, incumbents might be tempted to impose contracts that prevent their suppliers of complementary goods to also supply competing platforms. The economics of such contracts is very similar to the traditional analysis of exclusive dealing and foreclosure.[9] The main difference is that if consumers have a strong preference for variety, foreclosure can be successful even though, following a traditional competition law approach, one could argue that rival technologies still have access to a significant number of substitutes.

7 One should add that market shares themselves must be computed differently in network industries. In particular, shares in the companies' stock of customers might matter at least as much as shares of current sales.

8 See for example Jackson and Wolinski (1996) and Bala and Goyal (2000).

9 See Church and Gandal (2000) for a formal model.

In the case of ''social networks'' the main concern is the control of the interface. The general rule is that competition authorities should be wary of frequent interface modifications by dominant firms. This is more likely to be an issue in technologically dynamic fields where the interface might be protected by some form of intellectual property rights and where frequent changes can easily be presented as ''necessary for technological advancement''. The remedies that can be contemplated to ensure access depend on the nature of the network involved. In particular, ''physical'' networks might have limited capacity so that congestion effects must be considered. Given the information generally available to policymakers, designing appropriate access charges taking these effects into account might be difficult. It might then be preferable to decide on the number of firms required to ensure workable competition in the *access market*, divide capacity between these firms and let them choose whether they wish to use it for themselves or for resale.[10]

3. Conclusion

I would like to emphasize that this comment is not meant to provide a comprehensive framework for the antitrust assessment of network industries. Its more modest goal is to take a first stab at outlining a rough procedure to assess whether network effects are indeed likely to be critical to the case. Specific issues such as mergers and some potentially abusive conducts were only taken as examples. Clearly, many aspects were ignored. In particular, I did not discuss the effect of network effects on pricing and I did not even touch upon the relationship between network effects and innovation. On this last topic, the reader is referred to the recent work of Farrell and Katz (2003).

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